The Luxembourg BabelNet Workshop

3 March 2016: Session 7

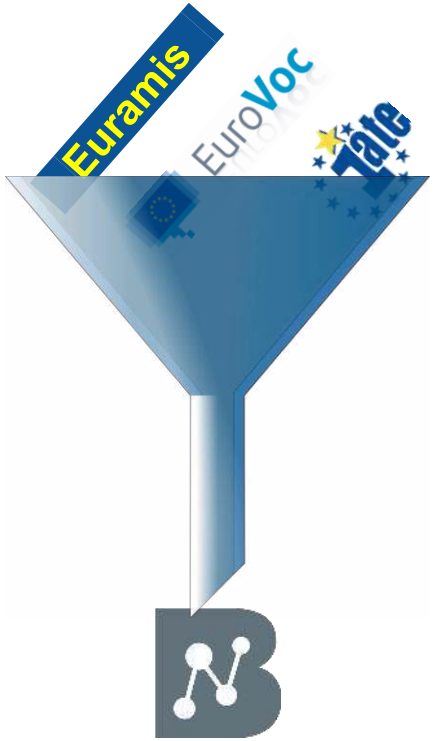
Linking IATE, EUROVOC and Euramis

Roberto Navigli

Session 7 – The Luxembourg BabelNet Workshop [13:15-14:45, 3 March, 2016]

- We will see **different strategies** to link three different resources to BabelNet (and, as a result, to each other):
  - IATE
  - EUROVOC
  - Euramis
- More resources can be linked with similar strategies, so it is just up to you to decide what to work on!
- You could add these resources to the LLOD!

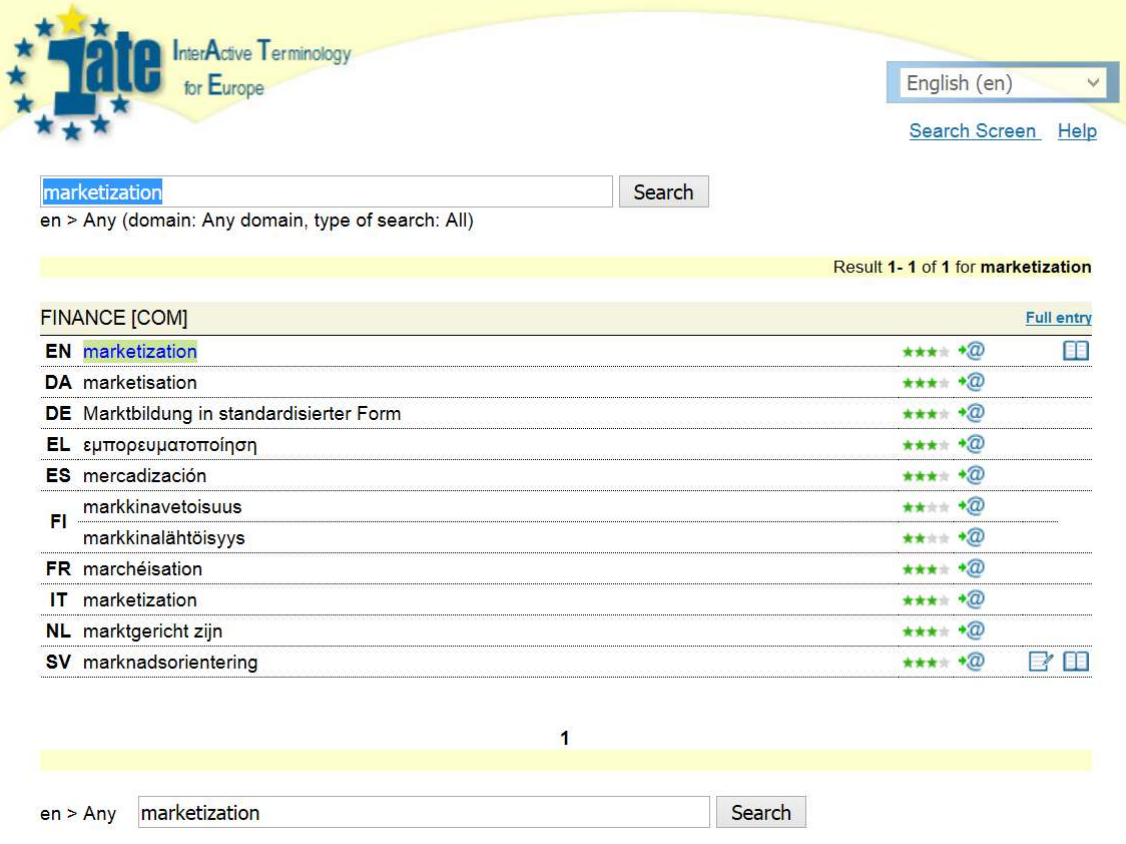
We have a dream!



IATE

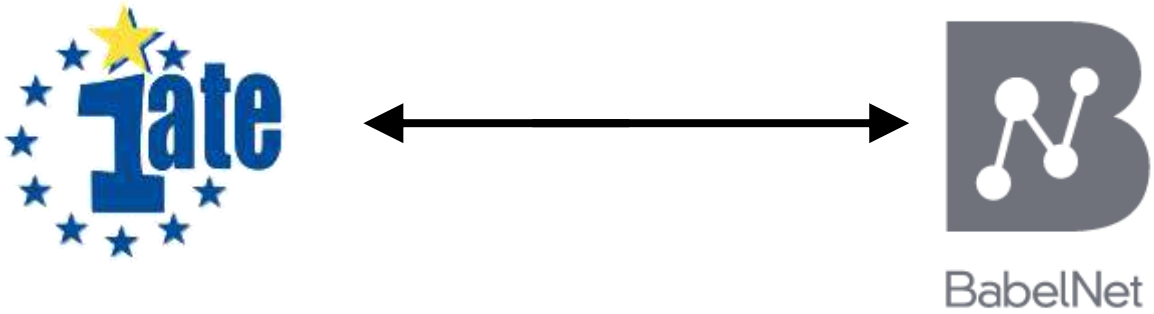
- **IATE** (Inter-Active Terminology for Europe) is the EU's inter-institutional terminology database.
- Administered by the **EU Translation Centre**
- Legacy databases imported into IATE:
  - Eurodicautom
  - TIS
  - Euterpe
  - Euroterms
  - CDCTERM
- Since 2002 it has been enriched by all EU translators
- A public version contains 8.5M validated terms from EU legislation in 110 domains in 24 languages

IATE


InterActive Terminology for Europe
English (en)
Search Screen
Help
marketization
Search
en > Any (domain: Any domain, type of search: All)
Result 1- 1 of 1 for marketization
FINANCE [COM]
Full entry
EN marketization
DA marketisation
DE Marktbildung in standardisierter Form
EL εμπορευματοποίηση
ES mercadización
FI markkinavetoisuus
markkinalähtöisyys
FR marchéisation
IT marketization
NL marktgericht zijn
SV marknadsorientering
1
en > Any
marketization
Search

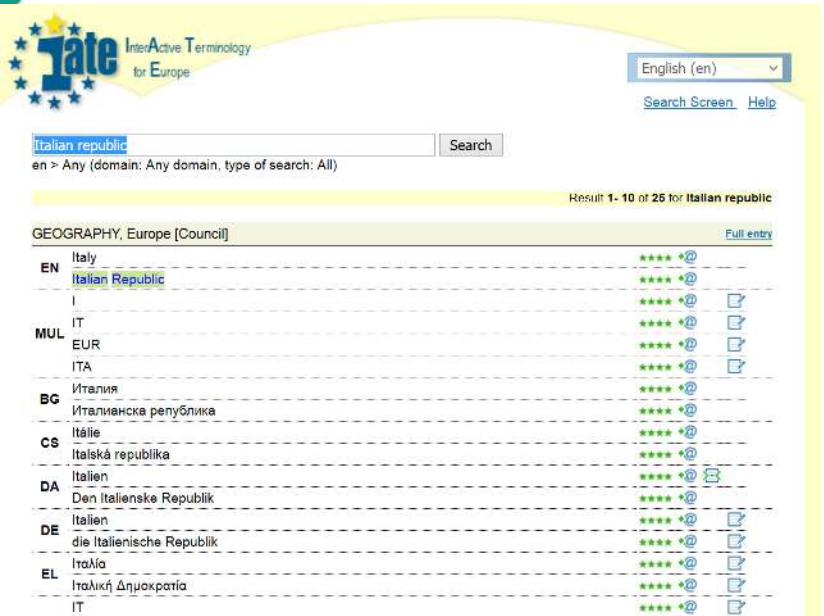
Linking IATE to BabelNet

Goal: To automatically (and semantically) link IATE to BabelNet using a **language- and resource-agnostic approach**



Linking IATE to BabelNet

Consider the entries for the Italian Republic in IATE and in BabelNet



Linking IATE to BabelNet

IATE-134173
(Italian Republic)

bn:00047706
(Italy)

BabelNet

Downloading IATE

IATE's dump is available for download at:

http://iate.europa.eu/tbxPageDownload.do

The dump contains: **lemmas**, **translations**, **domains**

```
<termEntry id="IATE-3567323">
    <descripGrp>
     <descrip type="subjectField">1016, 16, 2411004</descrip>
    </descripGrp>
    <langSet xml:lang="en">
     <tig>
      <term>national competitiveness board</term>
      <termNote type="termType">fullForm</termNote>
      <descrip type="reliabilityCode">2</descrip>
     </tig>
    </langSet>
    <langSet xml:lang="it">
     <tig>
      <term>comitato nazionale per la competitività</term>
      <termNote type="termType">fullForm</termNote>
      <descrip type="reliabilityCode">3</descrip>
     </tig>
    </langSet>
    <langSet xml:lang="fr">
     <tig>
      <term>conseil national de la compétitivité</term>
      <termNote type="termType">fullForm</termNote>
      <descrip type="reliabilityCode">3</descrip>
     </tig>
    </langSet>
</termEntry>
```

Downloading IATE

The dump is missing some important information.

Here is a query on the IATE website (**http://iate.europa.eu**) for the English term "**national competitiveness board**"

not in the dump

in the dump

Dominio	Costruzione europea, VITA ECONOMICA, Dominio sconosciuto

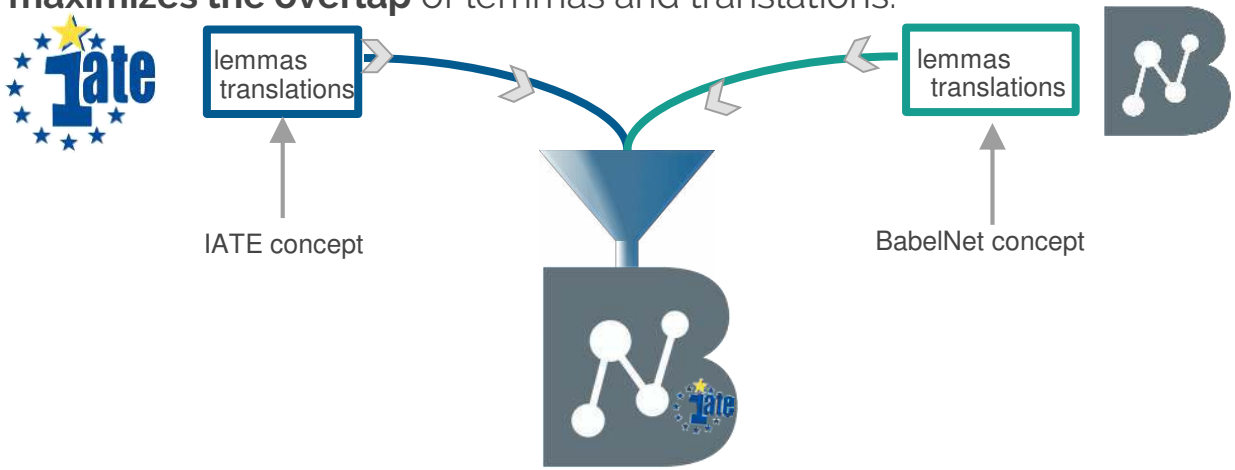
en

Definizione	board in the euro area Member State set up to monitor performance and policies in the field of competitiveness, thereby contributing to foster sustained economic convergence, and to increase ownership of the necessary reforms at the national level
Rif. della definizione	Recommendation for a Council recommendation on the establishment of National Competitiveness Boards within the Euro Area, COM/2015/0601 final, 52015DC0601:en:NOT" >52015DC0601/en COM-Internal document: SG/2015/80295/03/00, Council Recommendation on the establishment of National Competitiveness Boards within the Euro Area [21.10.2015]
Termine	**national competitiveness board**
Affidabilità	2 (Affidabilità minima)
Riferimento relativo ad un termine	Recommendation for a Council recommendation on the establishment of National Competitiveness Boards within the Euro Area, COM/2015/0601 final, 52015DC0601:en:NOT" >52015DC0601/en COM-Internal document: SG/2015/80295/03/00, Council Recommendation on the establishment of National Competitiveness Boards within the Euro Area [21.10.2015]
Contesto	'The setting up of **national competitiveness boards** in charge of tracking performance and policies in the field of competitiveness should contribute to the enhancement of ownership of the necessary policies and reforms at national levels and to improving the knowledge basis for Union economic policy coordination in the field of competitiveness.'
Rif. del contesto	Recommendation for a Council recommendation on the establishment of National Competitiveness Boards within the Euro Area, COM/2015/0601 final, recital 3, 52015DC0601:en:NOT" >52015DC0601/en
Data	11/12/2015

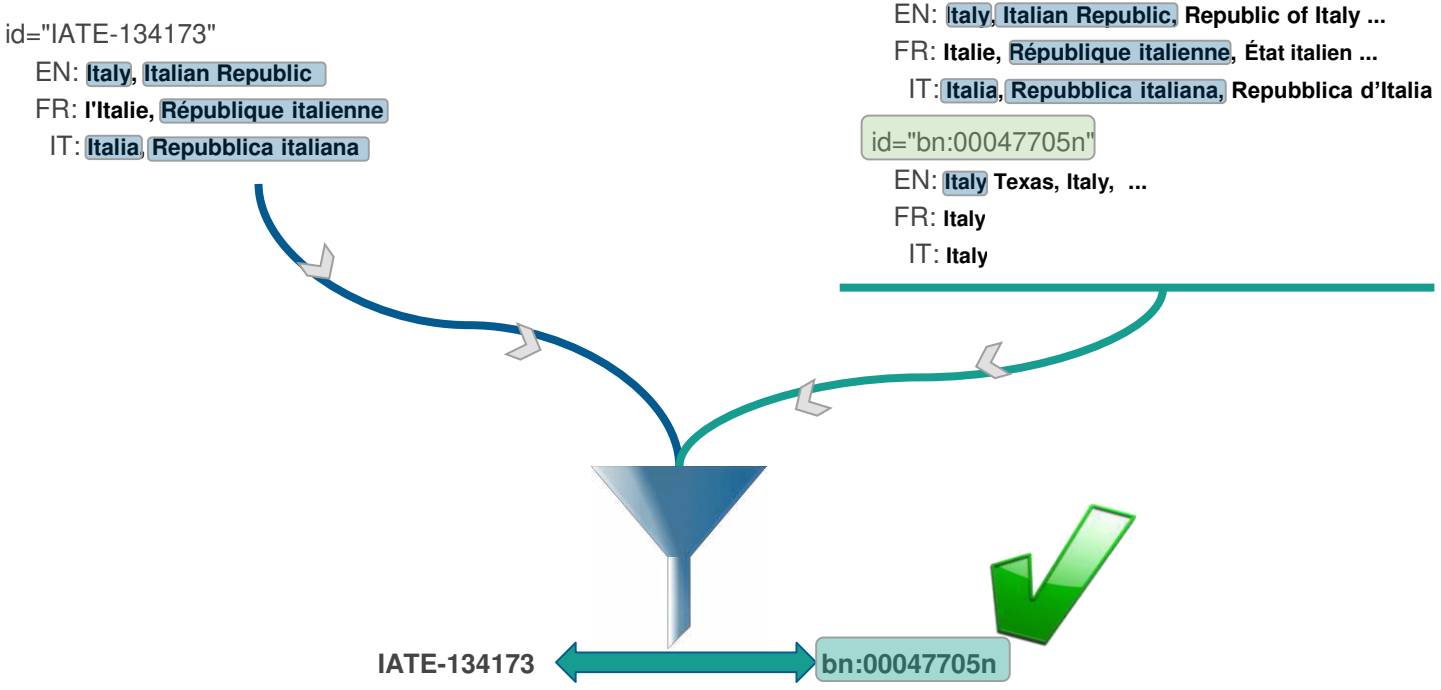
How to link IATE to BabelNet? (simple mapping)

By solely relying on domains, terms and translations, a first IATE-to-BabelNet mapping approach can be carried out in three steps:

1. Retrieve all **concepts** having the same English lemma in both resources (warning: an ambigous lemma can cover different concepts);
2. **Compare** each retrieved IATE concept against each BabelNet concept for the lemma;
3. Given a IATE concept, create a mapping to the BabelNet concept that **maximizes the overlap** of lemmas and translations.



How to link IATE to BabelNet? (simple mapping)



How to link IATE to BabelNet? (simple mapping)

id="IATE-1891456"
EN: Rome
FR: Rome
IT: Roma

id="bn:01341486n"
EN: Rome
FR: Rome
IT: Roma

id="bn:00015556n"
EN: Rome
FR: Rome
IT: Roma

No glosses

How to link IATE to BabelNet? (strong mapping)

We can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation**

How to link IATE to BabelNet? (strong mapping)

We can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation**

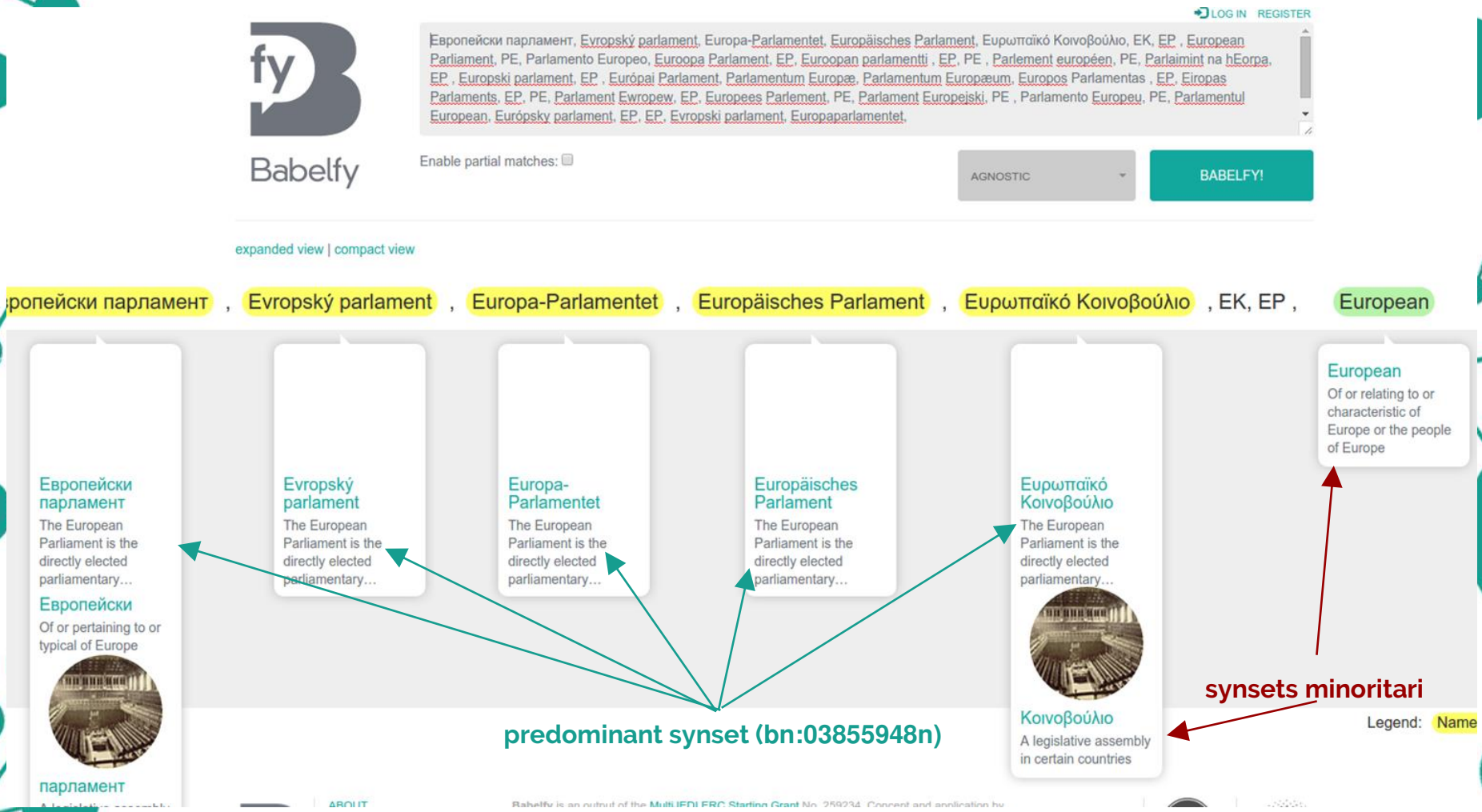
IATE-126540
(European Parliament)

InterActive Terminology for Europe
English (en)
Search Screen
Help
parlamento europeo
Search
it > bg cs da de el en es et fi fr ga hr hu it la lt lv mt nl pl pt ro sk sl sv (domain: Any domain, type of search: All)
Result 1- 10 of 172 for parlamento europeo
EU institution, Parliament [EP]
Full entry
IT PE
Parlamento europeo
BG ЕП
Европейски парламент
CS Evropský parlament
EP
DA Europa-Parlamentet
EP
DE EP
Europäisches Parlament
EL Ευρωπαϊκό Κοινοβούλιο
ΕΚ
EN EP
European Parliament
ES PE
Parlamento Europeo
ET Euroopa Parlament
EP
FI Euroopan parlamentti
No glosses
No Fear!

How to link IATE to BabelNet? (strong mapping)

Collect all the translations and synonyms and generate a multilingual input text for **Babelfy:**

"language agnostic" setting


LOG IN
REGISTER
Европейски парламент, Evropský parlament, Europa-Parlamentet, Europäisches Parlament, Ευρωπαϊκό Κοινοβούλιο, ΕΚ, ΕΡ , European Parliament, PE, Parlamento Europeo, Eurooopa Parlament, EP, Euroopan parlamentti , EP, PE , Parlement européen, PE, Parlaimint na hEorpa, EP , Europski parlament, EP , Európai Parlament, Parlamentum Europæ, Parlamentum Europæum, Europos Parlamentas , EP, Eiropas Parlaments, EP, PE, Parlament Ewropew, EP, Europees Parlement, PE, Parlament Europejski, PE , Parlamento Europeu, PE, Parlamentul European, Európsky parlament, EP, EP, Evropski parlament, Europaparlamentet,
Babelfy
Enable partial matches:
AGNOSTIC
BABELFY!
expanded view | compact view
ропейски парламент , Evropský parlament , Europa-Parlamentet , Europäisches Parlament , Ευρωπαϊκό Κοινοβούλιο , ΕΚ, ΕΡ , European
Европейски парламент
The European Parliament is the directly elected parliamentary…
Европейски
Of or pertaining to or typical of Europe
парламент
Evropský parlament
The European Parliament is the directly elected parliamentary…
Europa-Parlamentet
The European Parliament is the directly elected parliamentary…
Europäisches Parlament
The European Parliament is the directly elected parliamentary…
Ευρωπαϊκό Κοινοβούλιο
The European Parliament is the directly elected parliamentary…
Κοινοβούλιο
A legislative assembly in certain countries
European
Of or relating to or characteristic of Europe or the people of Europe
predominant synset (bn:03855948n)
synsets minoritari
Legend: Name

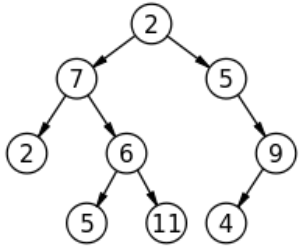
How to link IATE to BabelNet? (strong mapping)

IATE-126540
(European Parliament)

bn:03855948n
(European parliament)

How to link IATE to BabelNet? (strong mapping)

Another example: the term **tree**



How to link IATE to BabelNet? (strong mapping)

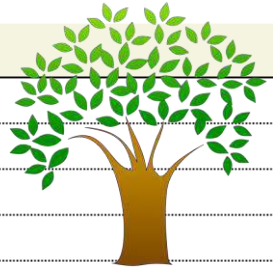
tree Search

en > en es fr it nl pl pt ro sk (domain: Any domain, type of search: All)

Result **1- 10** of **1003** for **tree**

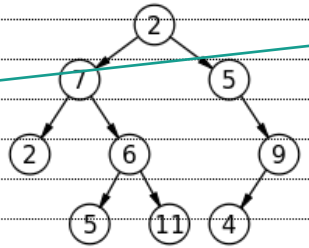
ENVIRONMENT [CdT] Full entry

EN	tree
ES	arboles
FR	arbre
IT	albero
NL	boom
PT	árvore, árvores



Electronics and electrical engineering [COM] Full entry

EN	tree
ES	árbol
FR	arbre
IT	albero
NL	boom
PT	árvore



If the lemma is the same, we can ~~still~~ use definitions

How to link IATE to BabelNet? (strong mapping)

tree Search

en > en es fr it nl pl pt ro sk (domain: Any domain, type of search: All)

Result **1- 10** of **1003** for **tree**

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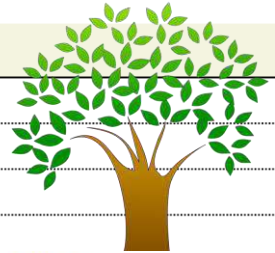
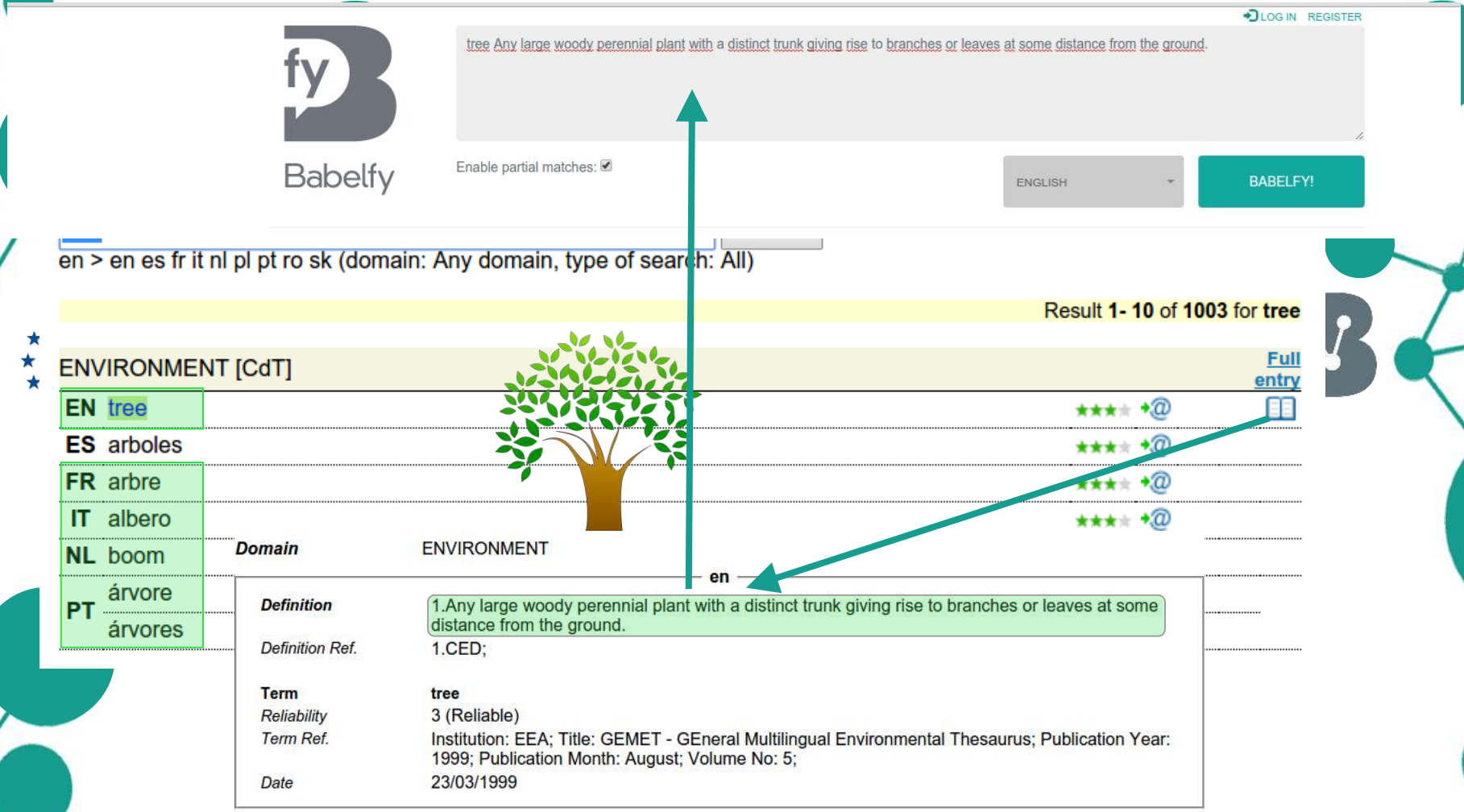


Domain ENVIRONMENT

en

Definition	1.Any large woody perennial plant with a distinct trunk giving rise to branches or leaves at some distance from the ground.
Definition Ref.	1.CED;
Term	**tree**
Reliability	3 (Reliable)
Term Ref.	Institution: EEA; Title: GEMET - GEneral Multilingual Environmental Thesaurus; Publication Year: 1999; Publication Month: August; Volume No: 5;
Date	23/03/1999


LOG IN
REGISTER
Babelfy
tree Any large woody perennial plant with a distinct trunk giving rise to branches or leaves at some distance from the ground.
Enable partial matches:
ENGLISH
BABELFY!
en > en es fr it nl pl pt ro sk (domain: Any domain, type of search: All)
Result 1- 10 of 1003 for tree
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Full entry
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Domain
ENVIRONMENT
en
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1.Any large woody perennial plant with a distinct trunk giving rise to branches or leaves at some distance from the ground.
Definition Ref.
1.CED;
Term
tree
Reliability
3 (Reliable)
Term Ref.
Institution: EEA; Title: GEMET - GEneral Multilingual Environmental Thesaurus; Publication Year: 1999; Publication Month: August; Volume No: 5;
Date
23/03/1999

LOG IN REGISTER

Babelfy

tree Any large woody perennial plant with a distinct trunk giving rise to branches or leaves at some distance from the ground.

Enable partial matches:

ENGLISH

BABELFY!

expanded view | compact view

tree Any large woody perennial plant with a distinct trunk giving rise to branches c

tree
A tall perennial woody plant having a main trunk and branches forming a distinct...

woody
Arthur Woody was born in Suches, Georgia.

perennial plant
(botany) a plant lasting for three seasons or more

perennial
Lasting three seasons or more

plant
(botany) a living organism lacking the

distinct
Constituting a separate entity or part

trunk
The main stem of a tree; usually covered with bark; the bole is usually the part that...

rise
A mountain range in the eastern United States extending from Quebec to the Gulf ...

branches
A division of a stem, or secondary stem arising from the main stem of a plant

Legen

LOG IN REGISTER

Babelfy

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A mountain range in the eastern United States extending from Quebec to the Gulf …

branches
A division of a stem, or secondary stem arising from the main stem of a plant

Correct Concept

Legen

How to link IATE to BabelNet? (strong mapping)

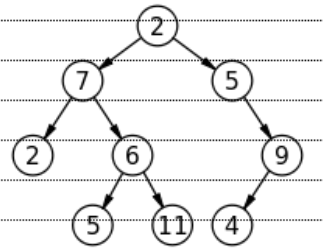
Domain	Electronics and electrical engineering

en

Definition	a connected set of branches joining all the nodes of a network without forming a loop
Definition Ref.	IEV 131-2-9,1978,Electrical and magnetic circuits
Term	**tree**
Reliability	3 (Reliable)
Term Ref.	IEV 131-2-9,1978,Electrical and magnetic circuits
Date	24/09/2003

Electronics and electrical engineering [COM] — Full entry

EN	tree
ES	árbol
FR	arbre
IT	albero
NL	boom
PT	árvore



How to link IATE to

LOG IN REGISTER

tree a connected set of branches joining all the nodes of a network without forming a loop

Babelfy

Enable partial matches:

ENGLISH

BABELFY!

Domain Electronics and electrical engineering

en

Definition	a connected set of branches joining all the nodes of a network without forming a loop
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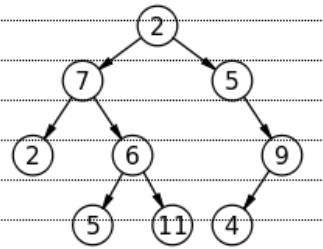
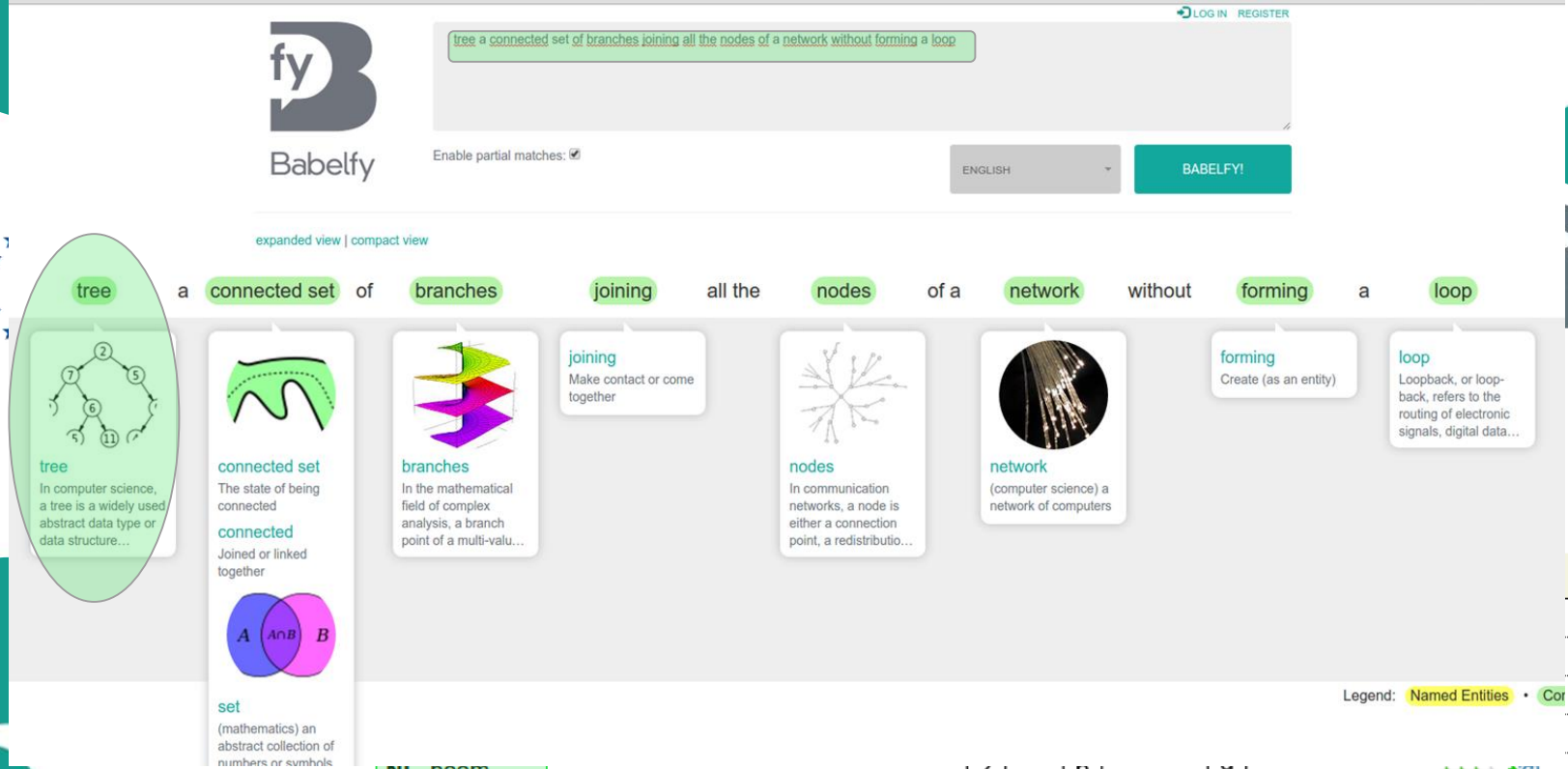
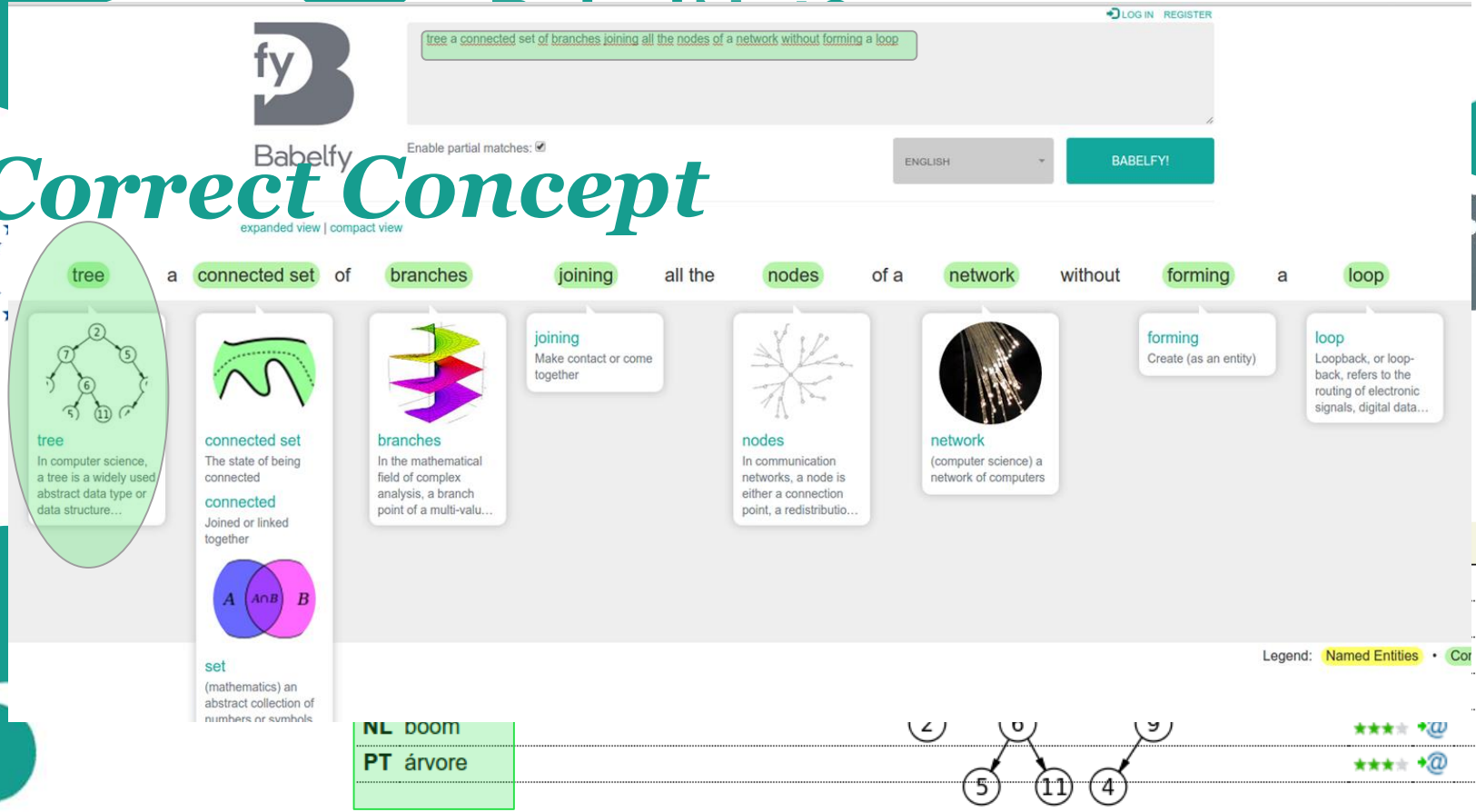


How to link IATE to



How to link IATE to



Correct Concept

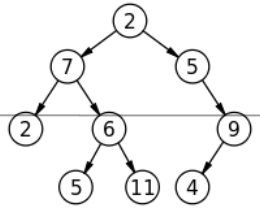
How to link IATE to BabelNet? (strong mapping)

IATE-49473
(tree)

bn:00078131n
(tree)

BabelNet

IATE-1372703
(tree)



bn:02429580n
(tree)

Conclusion (on IATE)

- The structure of IATE is mostly based on lemmas and textual definitions (even though no definition is available in the dump)

- Early mapping approach for IATE-BabelNet:

  - **Strategy:** Mapping based on translations and synonyms overlap

  - **Issue:** overlap-based mapping is not enough for concepts with few translations and/or synonyms

Conclusion (on IATE)

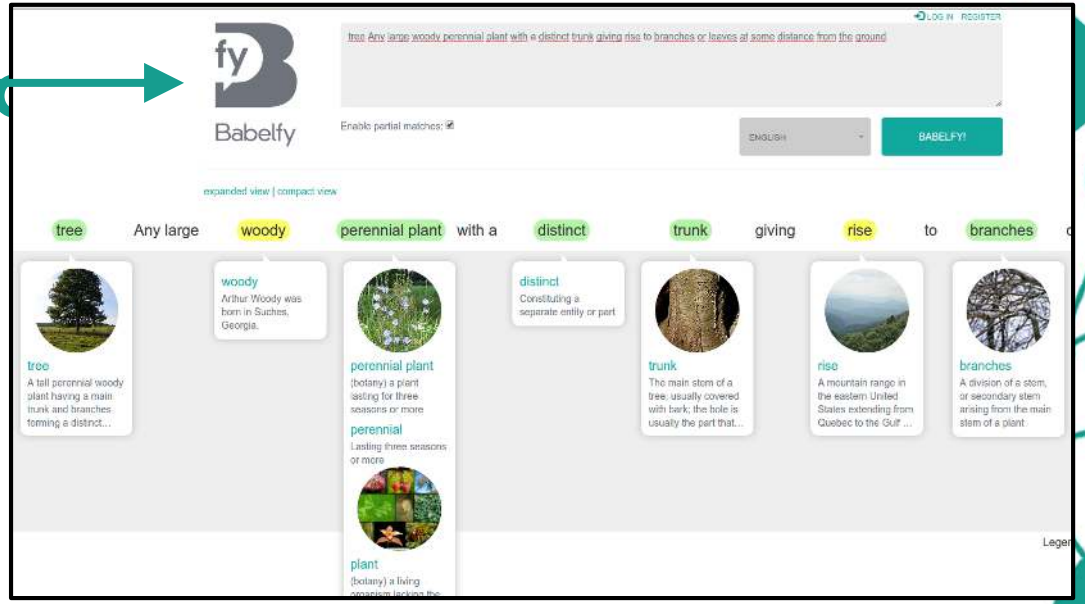
- “Stronger” mapping approach IATE-BabelNet:
  - By exploiting **Babelfy** we can potentially improve mapping accuracy and coverage
  - **Strategy #1:** Disambiguate all synonyms and translations at once using Babelfy with its *language-agnostic setting*; then select the **predominant sense** for the lemma of interest;
  - **Strategy #2:** Disambiguate the target lemma together with its *definitions* in IATE; a richer context will then enable Babelfy to identify the correct synset associated with the target.

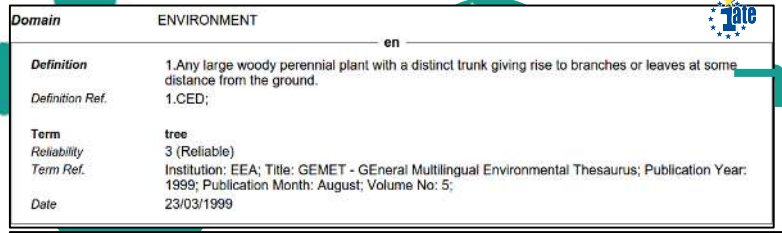
Conclusion (on IATE)

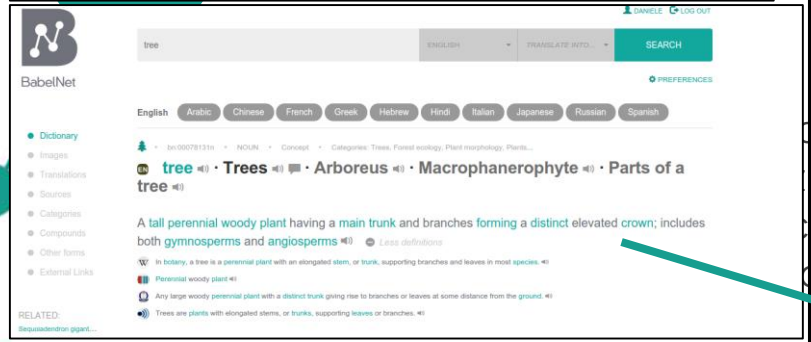
- A third possible mapping approach:
  - Disambiguate both *IATE and BabelNet definitions* associated with the target lemma; then compare the "**bag-of-synsets**" associated with each definition and select the *IATE concept-BabelNet synset* pair whose definition pair maximizes a predefined similarity measure.

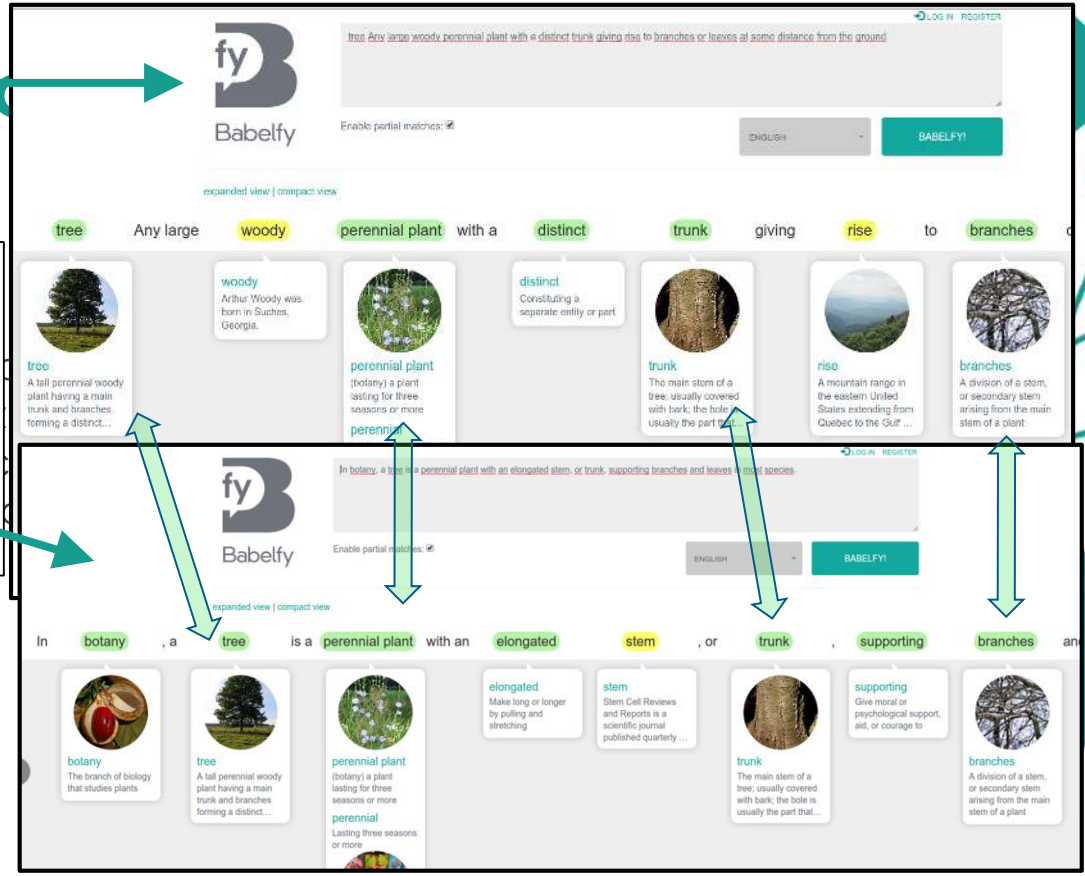
Let us look again at the previous example with the term "**tree**"

Domain	ENVIRONMENT
	en
Definition	1.Any large woody perennial plant with a distinct trunk giving rise to branches or leaves at some distance from the ground.
Definition Ref.	1.CED;
Term	**tree**
Reliability	3 (Reliable)
Term Ref.	Institution: EEA; Title: GEMET - GEneral Multilingual Environmental Thesaurus; Publication Year: 1999; Publication Month: August; Volume No: 5;
Date	23/03/1999

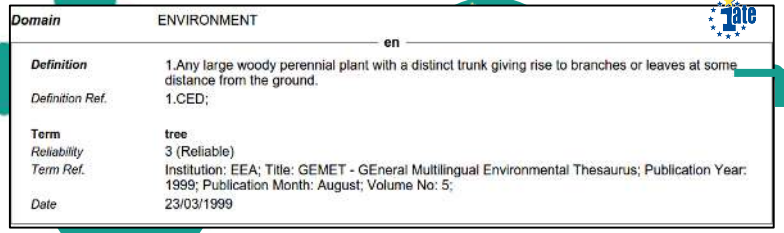


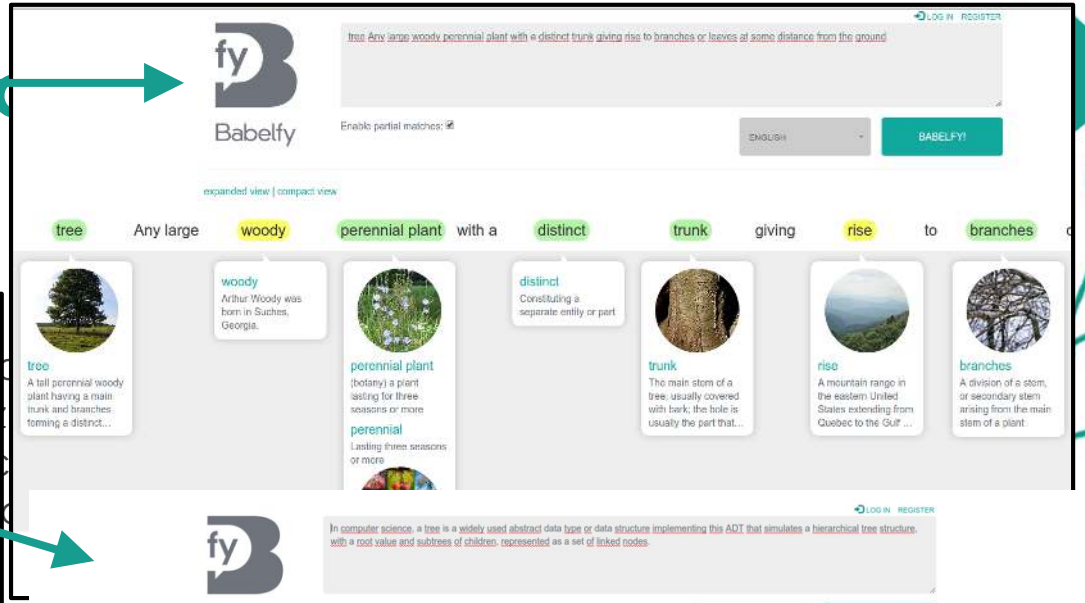


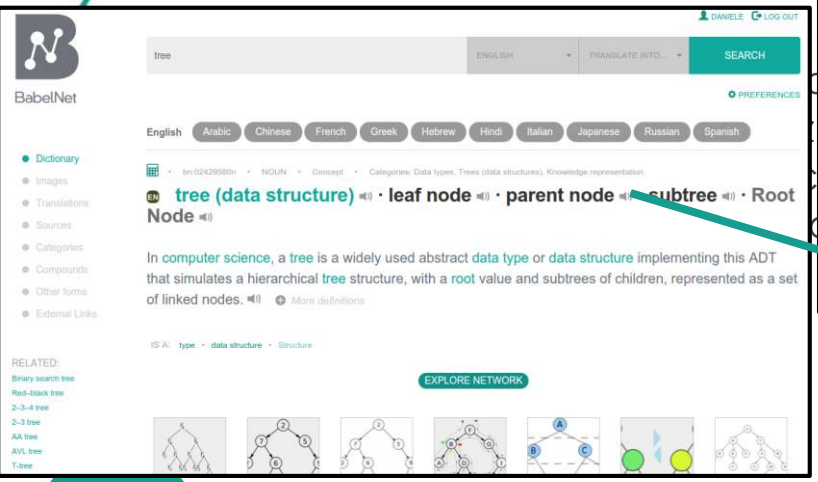


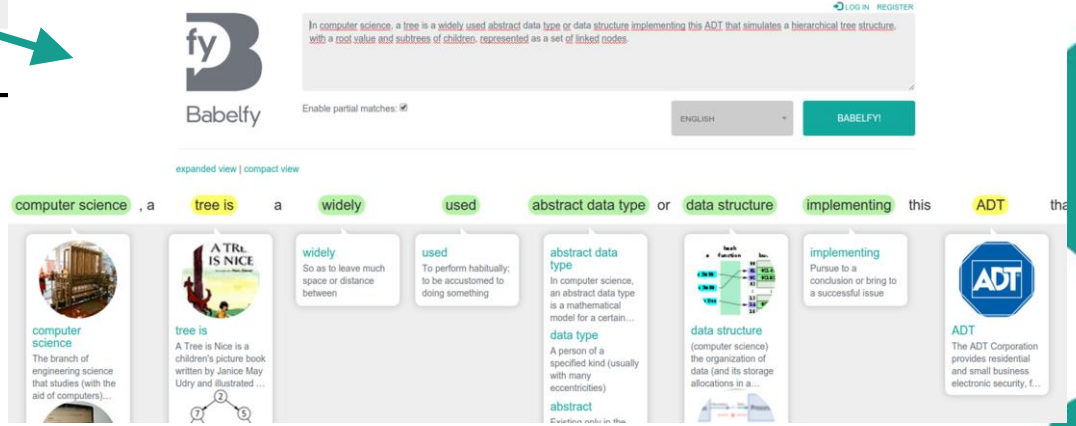


- **Higher similarity** between definitions = **larger number** of “shared” senses after disambiguation with Babelfy









- **No** shared senses after disambiguation = **low (zero)** similarity between definitions

Conclusion

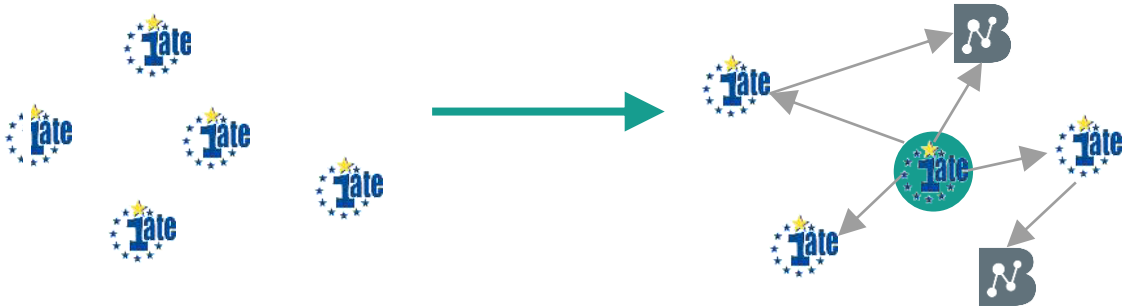
Advantages

- By integrating with BabelNet, IATE will greatly enlarge its scope and extend its multilingual dictionary from **24** to more than **250** languages.
- At the same time it will enrich BabelNet with additional domain-specific concepts

Advantages

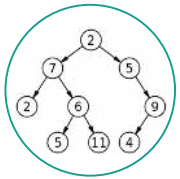
Thanks to the IATE-BabelNet mapping, IATE will be able to directly exploit the BabelNet knowledge graph, and become a full-fledged **semantic network** itself.

An interconnected network of concepts will enable new ways of exploring the resource, based on **semantic connections** across related concepts and entities



Advantages

- IATE will benefit from the vast amount of additional information encoded in BabelNet, such as **images**
- It will be possible to **identify duplicate and overlapping concepts**



tree Search

en > en es fr it nl pl pt ro sk (domain: Any domain, type of search: All)

Result **1- 10** of **1003** for **tree**

ENVIRONMENT [CdT]		Full entry
EN	tree	
ES	arboles	
FR	arbre	
IT	albero	
NL	boom	
PT	árvore	
	árvores	

Electronics and electrical engineering [COM]		Full entry
EN	tree	
ES	árbol	
FR	arbre	
IT	albero	
NL	boom	
PT	árvore	

EuroVoc

MIND
THE LEXICAL
GAP
EuroVoc
Building block
of the semantic web

EuroVoc

MIND THE LEXICAL GAP
EuroVoc Building block of the semantic web

- EuroVoc is a multilingual, multidisciplinary **thesaurus** covering the activities of the EU, the European Parliament in particular

- It contains terms in **23** EU languages (Bulgarian, Croatian, Czech, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Italian, Latvian, Lithuanian, Maltese, Polish, Portuguese, Romanian, Slovak, Slovenian, Spanish and Swedish), plus Albanian, the language of the FYROM and Serbian

- EuroVoc is managed by the **Publications Office**, which moved forward to **ontology-based thesaurus management** and **semantic Web technologies** following W3C recommendations as well as latest trends in thesaurus standards

Languages	Preferred Terms	Non Preferred Terms (Synonym)	Definitions
BG	6 883	1 681	78
ES	6 883	8 904	229
CS	6 883	14 074	92
DA	6 883	7 594	229
DE	6 883	9 494	227
ET	6 883	7 116	93
EL	6 883	8 092	227
EN	6 883	8 348	233
FR	6 883	8 057	228
IT	6 883	10 592	228
..	..	..	..

EuroVoc

- EuroVoc is already a **semantic network**
- EuroVoc is based on **domains** (21 overall)
- Each domain is further subdivided into **sub-domains** (127 overall)

EuroVoc

- EuroVoc is already a **semantic network**;
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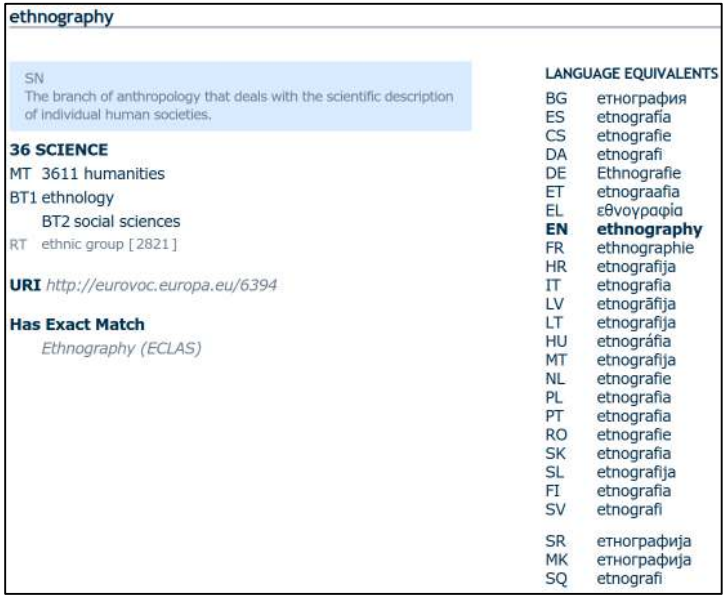
- Each domain is further subdivided into **sub-domains** (127 overall)

  - POLITICS
  - INTERNATIONAL RELATIONS
  - EUROPEAN UNION
  - LAW
  - SCIENCE
  - …

    - **political framework**
    - **political party**
    - **electoral procedure and voting**
    - **parliament**
    - **parliamentary proceedings**
    - …

EuroVoc

- A EuroVoc entry contains:
  - **synonyms**
  - **translations**
  - **definitions** in multiple languages
  - **domains**
  - **sub-domains**
  - **relations**



ethnography

SN
The branch of anthropology that deals with the scientific description of individual human societies.

36 SCIENCE
MT 3611 humanities
BT1 ethnology
BT2 social sciences
RT ethnic group [2821]

URI *http://eurovoc.europa.eu/6394*

Has Exact Match
Ethnography (ECLAS)

LANGUAGE EQUIVALENTS

BG	етнография
ES	etnografía
CS	etnografie
DA	etnografi
DE	Ethnografie
ET	etnograafia
EL	εθνογραφία
EN	**ethnography**
FR	ethnographie
HR	etnografija
IT	etnografia
LV	etnogrāfija
LT	etnografija
HU	etnográfia
MT	etnografija
NL	etnografie
PL	etnografia
PT	etnografia
RO	etnografie
SK	etnografia
SL	etnografija
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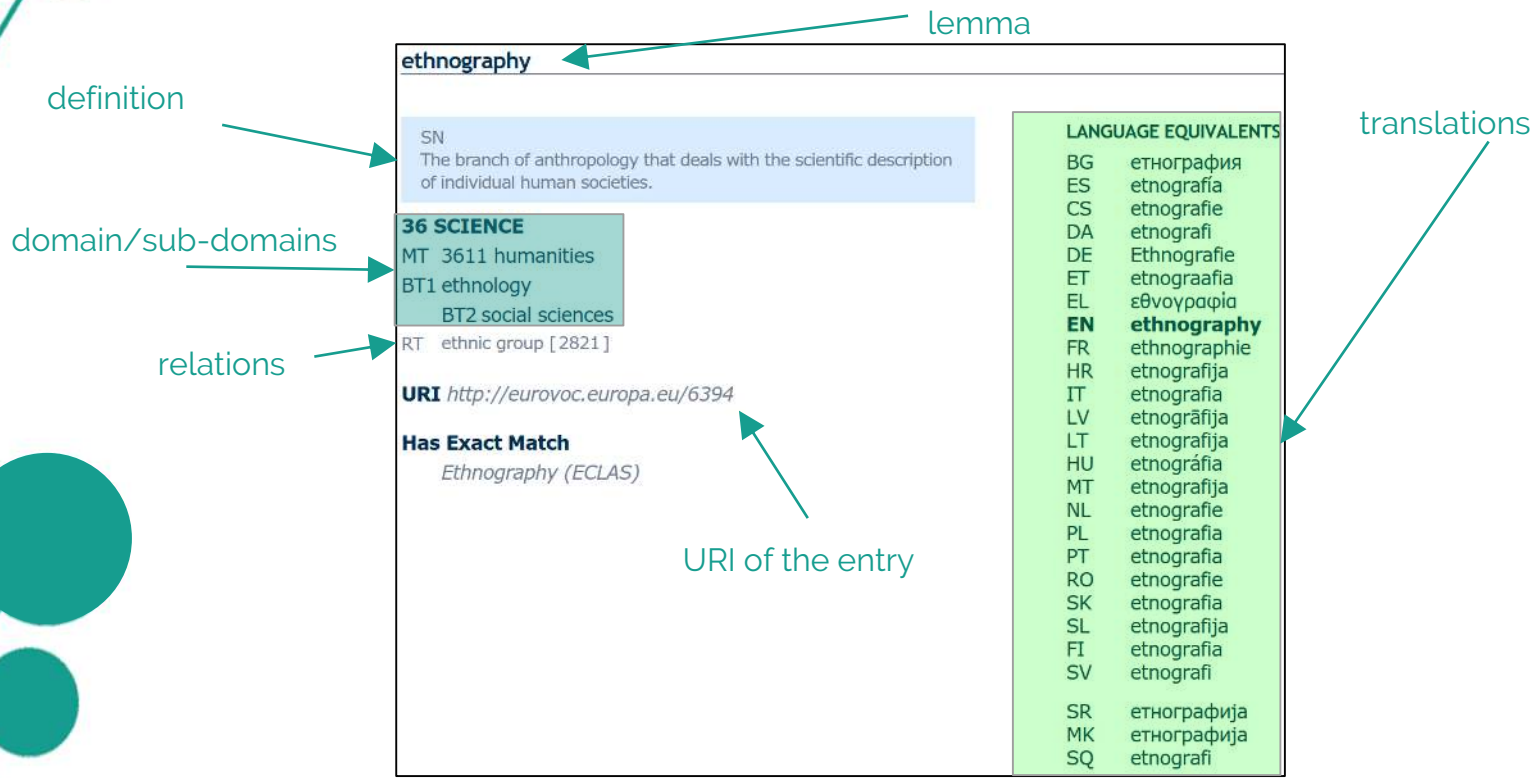
SR	етнографија
MK	етнографија
SQ	etnografi

EuroVoc


lemma
definition
translations
domain/sub-domains
relations
URI of the entry
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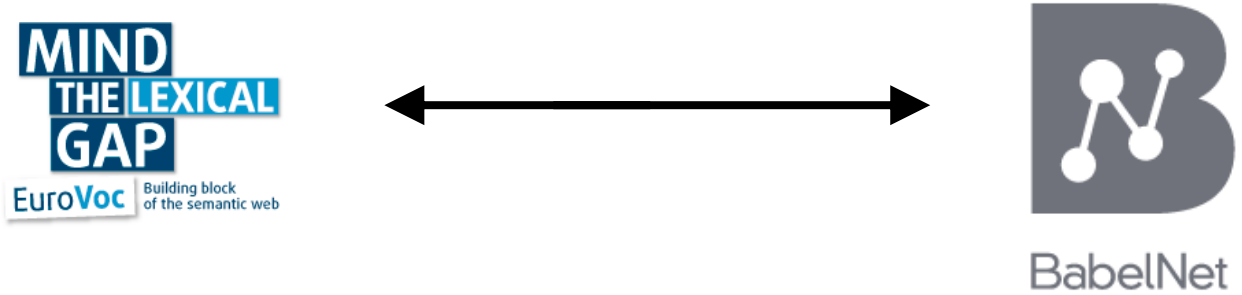
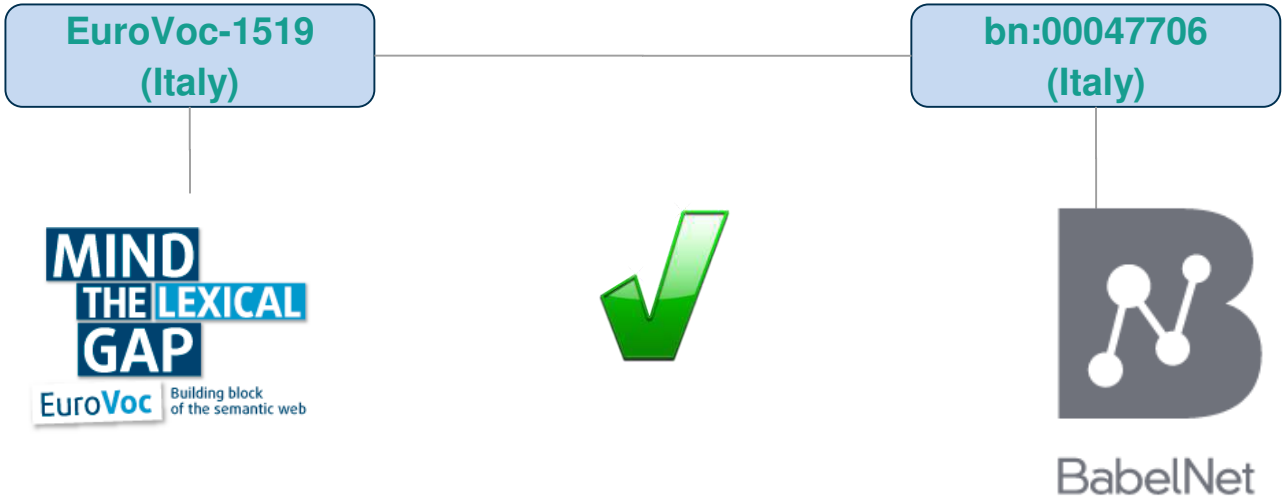
SK etnografia
SL etnografija
FI etnografia
SV etnografi
SR етнографија
MK етнографија
SQ etnografi

Linking EuroVoc to BabelNet

- **Goal**: To automatically (and semantically) link EuroVoc to BabelNet using a **language- and resource-agnostic approach**



Linking EuroVoc to BabelNet



How to link EuroVoc to BabelNet? (strong mapping)

Again we can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation.**

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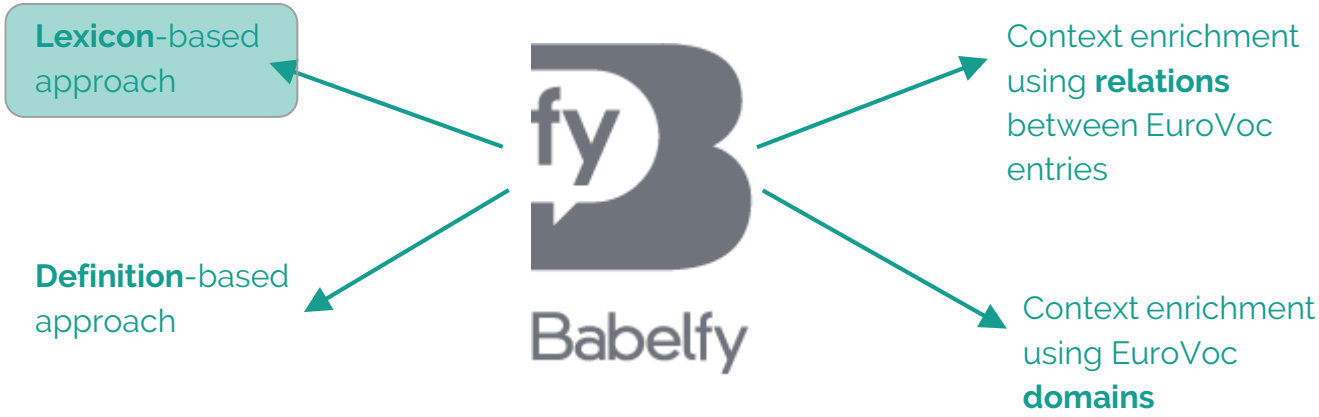


How to link EuroVoc to BabelNet? (strong mapping - 1)

Lexicon-based approach

Target word: **cement**

How to link EuroVoc to BabelNet? (strong mapping - 1)

Lexicon-based approach

Target word: **cement**

cement

UF *cement industry*

68 INDUSTRY

MT 6831 building and public works

BT1 building materials

BT2 building industry

URI *http://eurovoc.europa.eu/5993*

Has Exact Match

Cement (AGROVOC)
Cement (ECLAS)
cement (GEMET)
cement (UNBIS)

Has Related Match

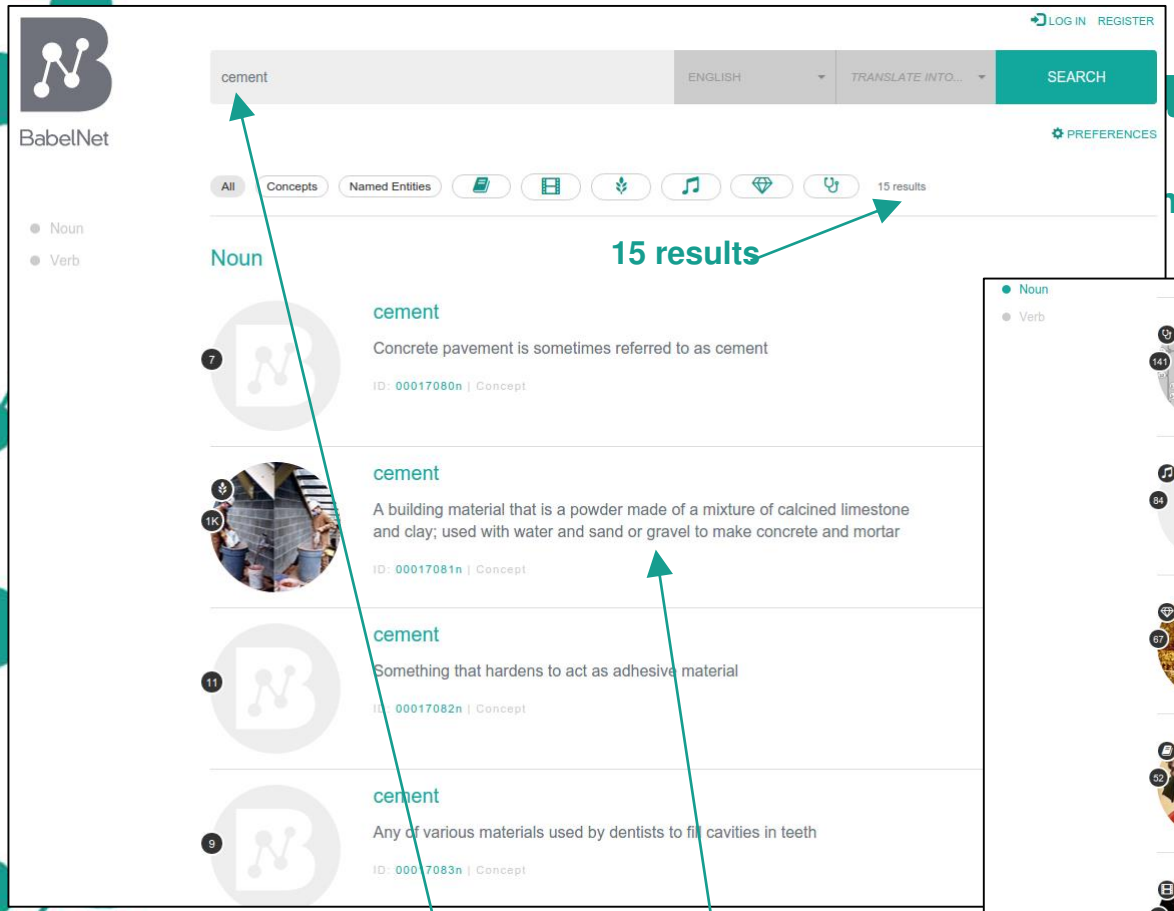
Cement industry (ECLAS)
cement industry (GEMET)
cement manufacture (GEMET)
cement industry (UNBIS)

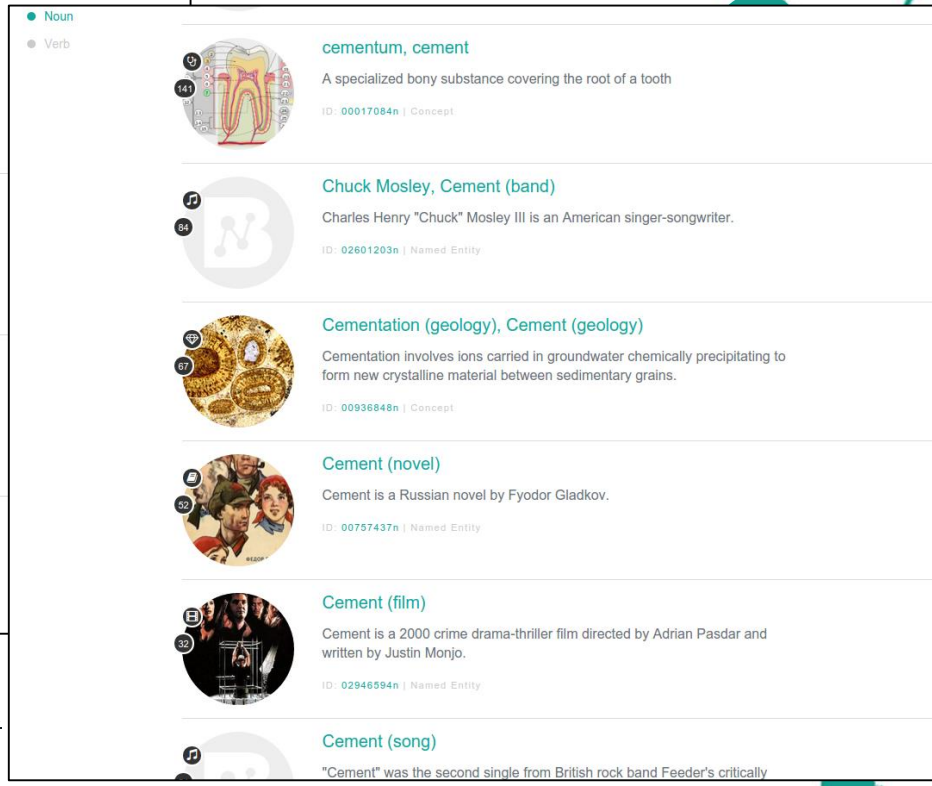
LANGUAGE EQUIVALENTS

BG	цимент
ES	cemento
CS	cement
DA	cement
DE	Zement
ET	tsement
EL	τσιμέντο
EN	**cement**
FR	ciment
HR	cement
IT	cemento
LV	cements
LT	cementas
HU	cement
MT	siment
NL	cement
PL	cement
PT	cimento
RO	ciment
SK	cement
SL	cement
FI	sementti
SV	cement
SR	цемент
MK	цемент
SQ	çimento

roVoc to

ng mapping - 1)





Target word: **cement**

Correct mapping to EuroVoc

How to link EuroVoc to BabelNet? (strong mapping - 1)

How to link EuroVoc to BabelNet? (strong mapping - 1)

cement

UF *cement industry*

68 INDUSTRY
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Cement (AGROVOC)
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LANGUAGE EQUIVALENTS

BG	цимент
ES	cemento
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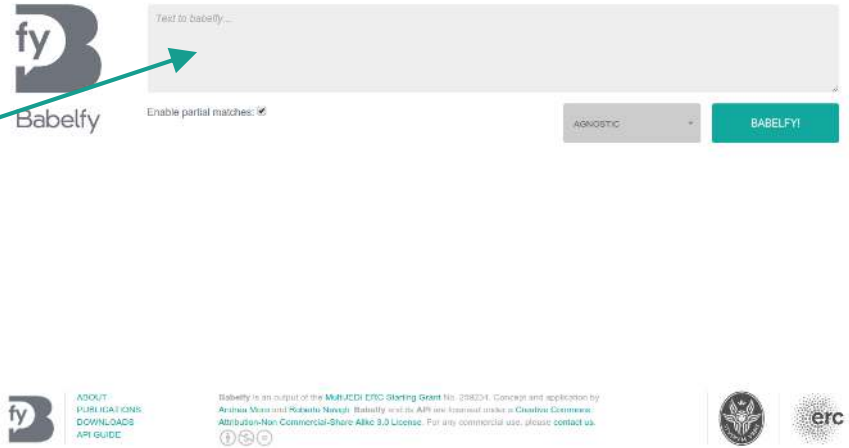
DE	Zement
ET	tsement
EL	τσιμέντο
EN	**cement**
FR	ciment
HR	cement
IT	cemento
LV	cements
LT	cementas
HU	cement
MT	siment
NL	cement
PL	cement
PT	cimento
RO	ciment
SK	cement
SL	cement
FI	sementti
SV	cement
SR	цемент
MK	цемент
SQ	çimento

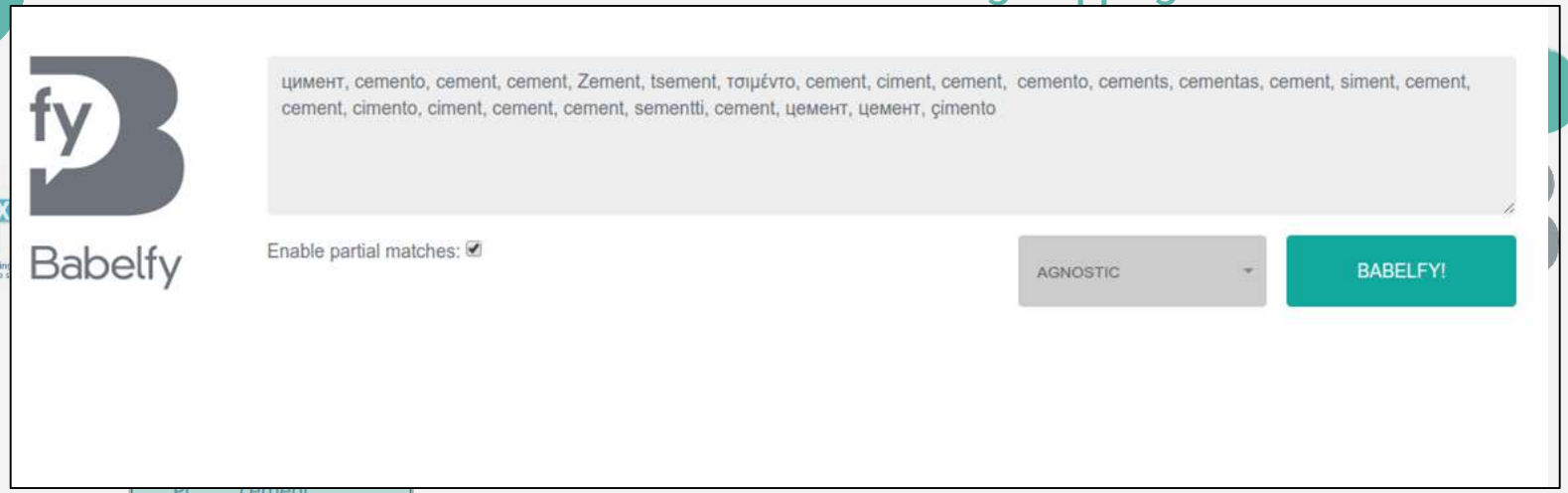
How to link EuroVoc to BabelNet? (strong mapping - 1)

LANGUAGE EQUIVALENTS	
BG	цимент
ES	cemento
CS	cement
DA	cement
DE	Zement
ET	tsement
EL	τσιμέντο
EN	**cement**
FR	ciment
HR	cement
IT	cemento
LV	cements
LT	cementas
HU	cement
MT	siment
NL	cement
PL	cement
PT	cimento
RO	ciment
SK	cement
SL	cement
FI	sementti
SV	cement
SR	цемент
MK	цемент
SQ	çimento

Lexicon-based approach - **cement**



How to link EuroVoc to BabelNet? (strong mapping - 1)



PL	cement
PT	cimento
RO	ciment
SK	cement
SL	cement
FI	sementti
SV	cement
SR	цемент
MK	цемент
SQ	çimento

LOG IN REGISTER

Babelfy

цимент, cemento, cement, cement, Zement, tsement, τσιμέντο, cement, ciment, cement, cemento, cements, cementas, cement, siment, cement, cement, cimento, ciment, cement, cement, sementti, cement, цемент, цемент, çimento

Enable partial matches:

AGNOSTIC

BABELFY!

expanded view | compact view

цимент , cemento , cement , cement , Zement , tsement , τσιμέντο , cement , ciment ,

цимент
A building material that is a powder made of a mixture of calcined limestone…

cemento
A building material that is a powder made of a mixture of calcined limestone…

cement
A building material that is a powder made of a mixture of calcined limestone…

cement
A building material that is a powder made of a mixture of calcined limestone…

Zement
A building material that is a powder made of a mixture of calcined limestone…

tsement
A building material that is a powder made of a mixture of calcined limestone…

τσιμέντο
A building material that is a powder made of a mixture of calcined limestone…

cement
A building material that is a powder made of a mixture of calcined limestone…

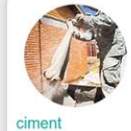
ciment
A building material that is a powder made of a mixture of calcined limestone…

PL
PT
RO
SK
SL
FI
SV

SR
MK
SQ

expanded view | compact view

nto , ciment , cement , cement , sementti , cement , цемент , цемент , çimento



ciment
A building material that is a powder made of a mixture of calcined limestone

cement
A building material that is a powder made of a mixture of calcined limestone

cement
A building material that is a powder made of a mixture of calcined limestone

sementti
A building material that is a powder made of a mixture of calcined limestone

cement
A building material that is a powder made of a mixture of calcined limestone

цемент
A building material that is a powder made of a mixture of calcined limestone

цемент
A building material that is a powder made of a mixture of calcined limestone

çimento
A building material that is a powder made of a mixture of calcined limestone

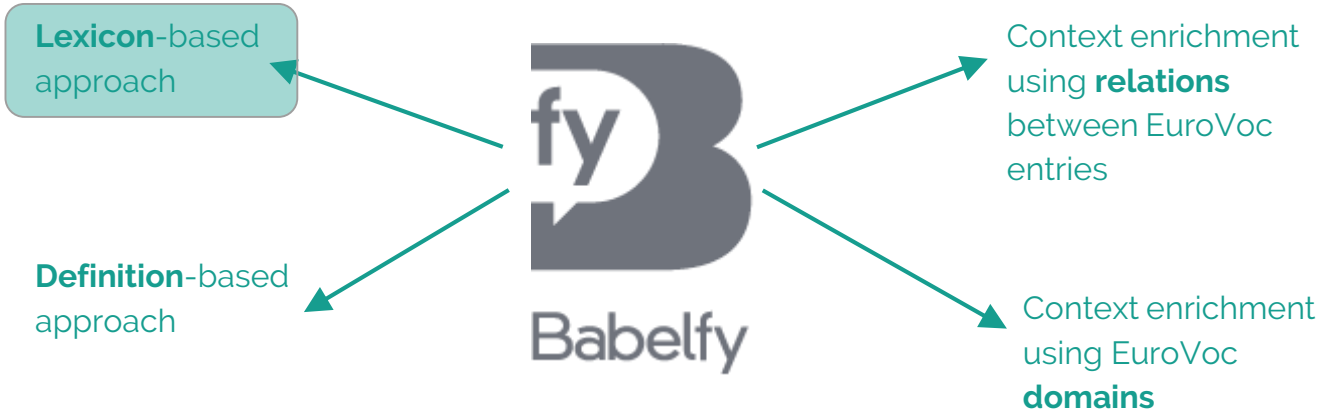
How to link EuroVoc to BabelNet? (strong mapping - 1)

EuroVoc-5993
(cement)

bn:00017081n
(cement)

How to link EuroVoc to BabelNet? (strong mapping)

We can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation.**



How to link EuroVoc to BabelNet? (strong mapping)

We can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation.**

Same approach used for IATE

How to link EuroVoc to BabelNet? (strong mapping)

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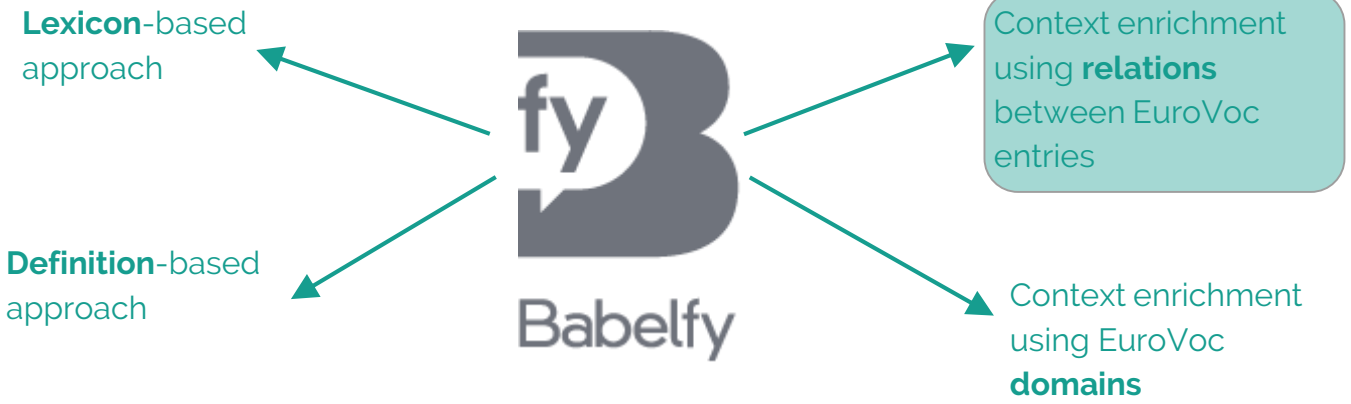


How to link EuroVoc to BabelNet? (strong mapping - 3)

Context enrichment using **relations** between EuroVoc entries

Target word: **missile**

How to link EuroVoc to BabelNet?

Context enrichment using **relations** between EuroVoc entries

Target word: **missile**

missile

UF *nuclear missile*

08 INTERNATIONAL RELATIONS

MT 0821 defence
BT1 military equipment
NT1 anti-missile defence
NT1 ballistic missile
NT1 guided missile
NT1 intercontinental missile

RT Euro-missile [0816]
nuclear technology [6621]

URI *http://eurovoc.europa.eu/1944*

Has Exact Match
Missiles (ECLAS)

LANGUAGE EQUIVALENTS

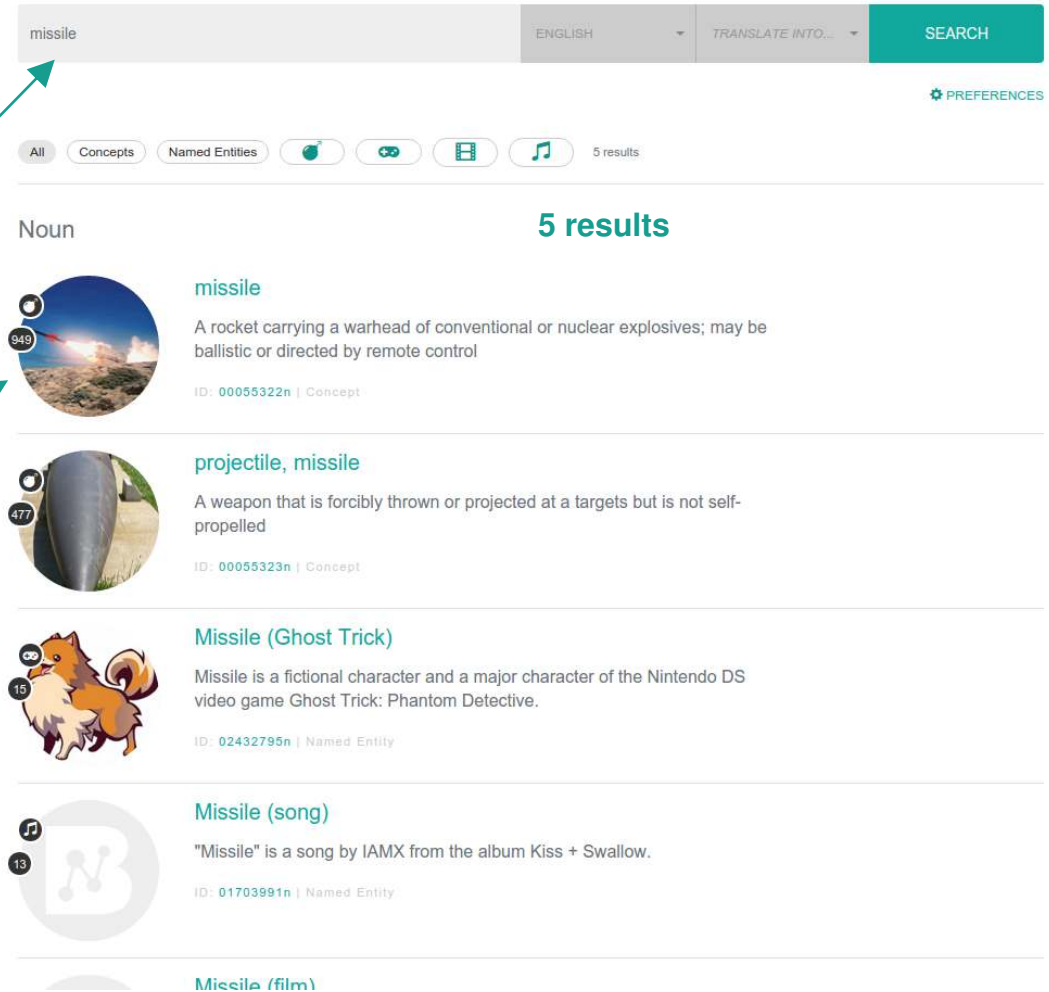
BG	ракета
ES	misil
CS	raketa
DA	missil
DE	Rakete
ET	rakett
EL	πύραυλοι
EN	**missile**
FR	missile
HR	projektil
IT	missile
LV	raķete
LT	raketa
HU	rakéta
MT	missila
NL	raket
PL	broń rakietowa
PT	míssil
RO	rachetă
SK	raketa
SL	izstrelek
FI	ohjus
SV	robot
SR	ракета
MK	проектил
SQ	raketë

EuroVoc

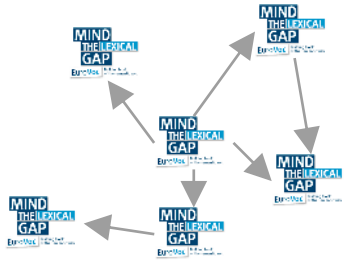
Target word: **missile**

MIND THE LEXICAL GAP
EuroVoc Building block of the semantic web

Correct mapping to EuroVoc



How to link EuroVoc to BabelNet? (strong mapping - 3)



EuroVoc Graph

+

Babelfy

How to link EuroVoc to BabelNet? (strong mapping - 3)

missile

UF *nuclear missile*

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RT Euro-missile [0816]
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URI *http://eurovoc.europa.eu/1944*

Has Exact Match
Missiles (ECLAS)

Euro-missile

RDF/XML

UF *Eurostrategic weapon*
INF
intermediate nuclear force

08 INTERNATIONAL RELATIONS
MT 0816 international balance
BT1 international security
RT missile [0821]

URI *http://eurovoc.europa.eu/3505*

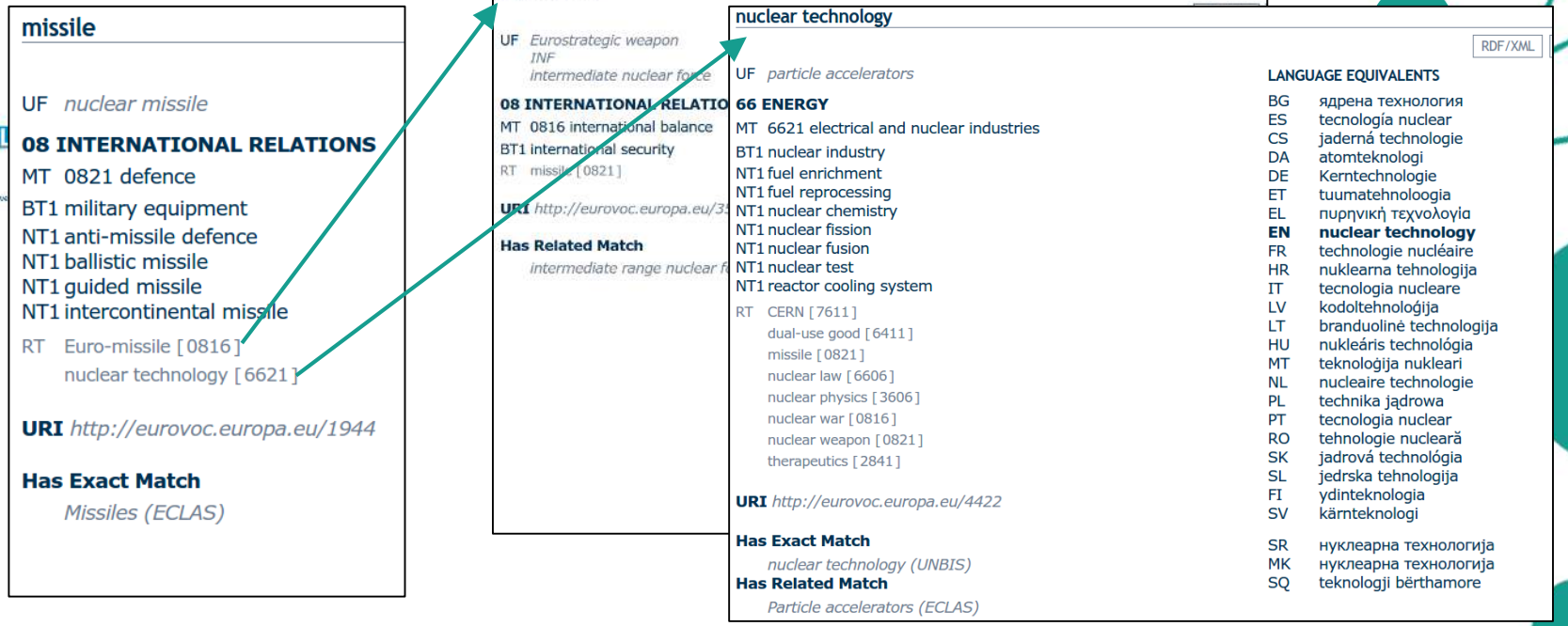
Has Related Match
intermediate range nuclear forces (UNBIS)

LANGUAGE EQUIVALENTS

BG	Европакета
ES	euromisil
CS	eurorakety
DA	euromissil
DE	Eurorakete
ET	eurorakett
EL	ευρωπαϊκοί πύραυλοι
EN	**Euro-missile**
FR	euromissile
HR	euroraketa
IT	euromissile
LV	Eiropas darbības rādiusa raķete
LT	euroraketa
HU	euromissile
MT	Ewromissila
NL	euroraket
PL	eurorakieta
PT	euromísseis
RO	eurorachete
SK	eurorakety
SL	evroraketa
FI	euro-ohjus
SV	euromissil
SR	евро-ракета
MK	европакета
SQ	Euro-raketë

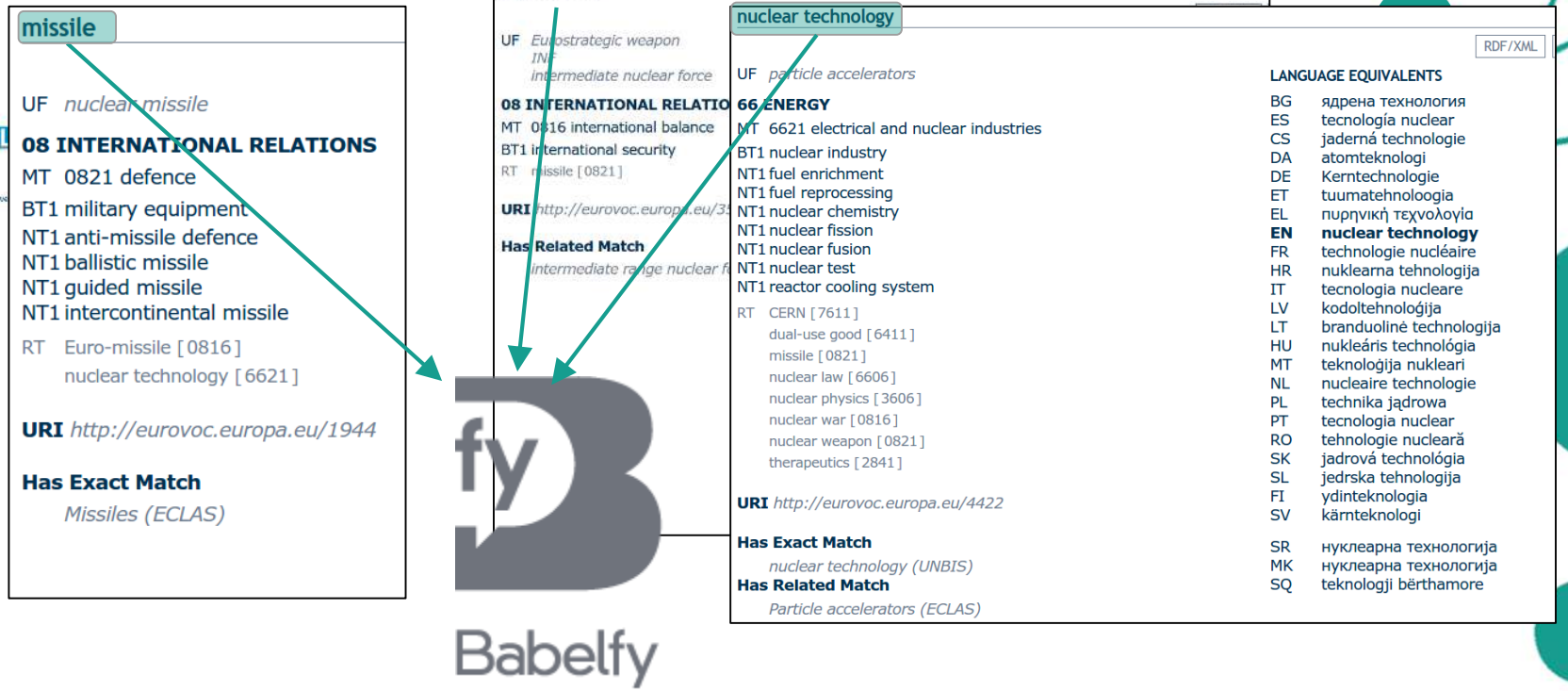
EuroVoc Graph

How to link EuroVoc to BabelNet? (strong mapping - 3)

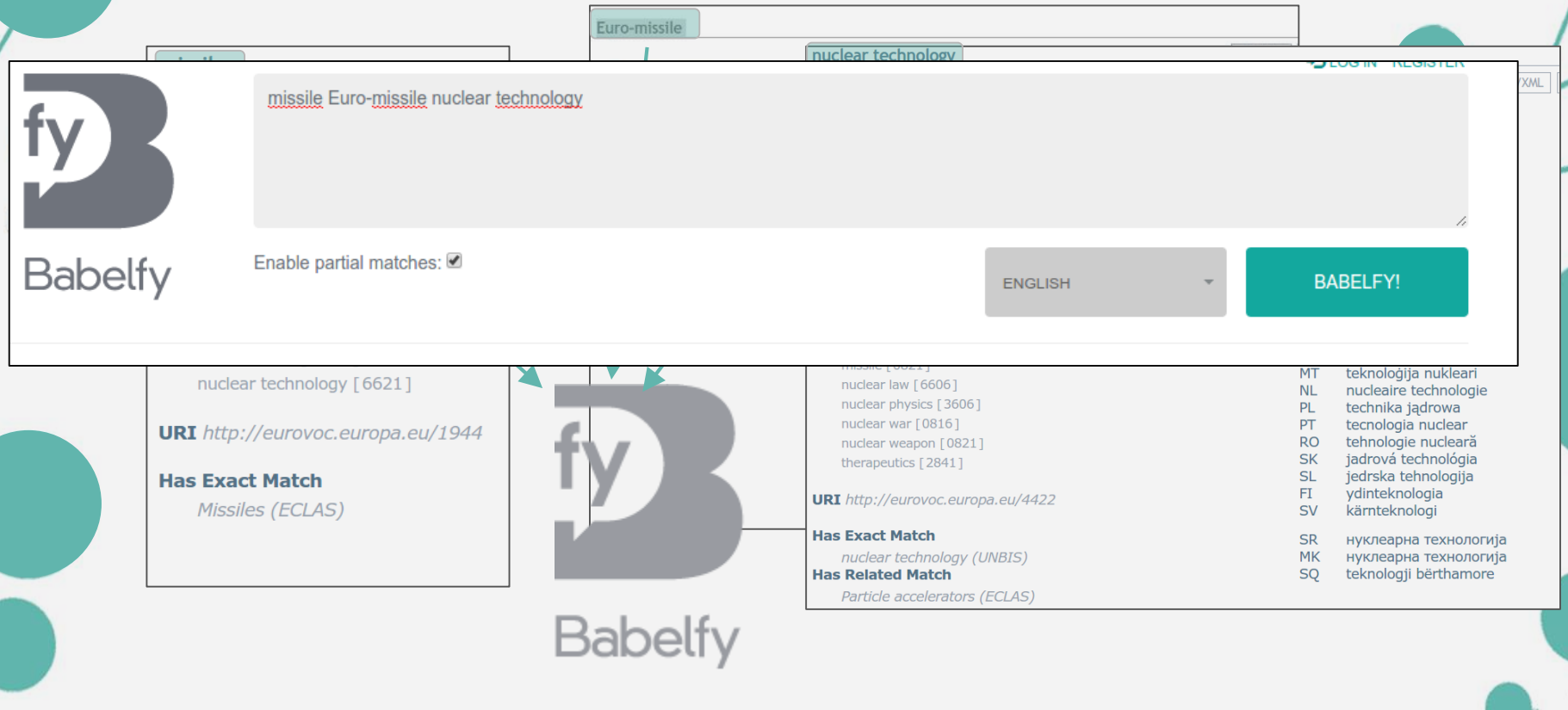


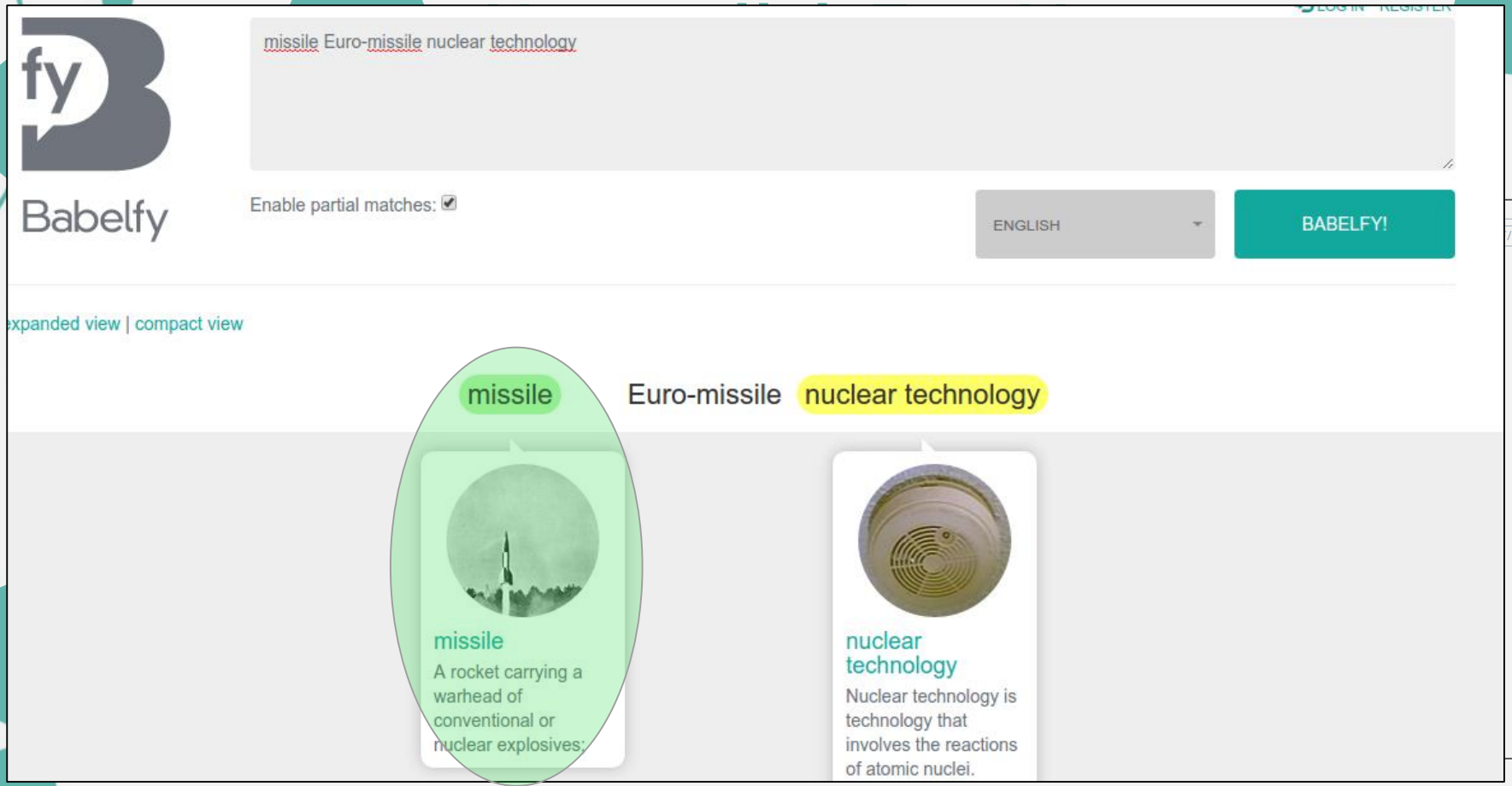
EuroVoc Graph

How to link EuroVoc to BabelNet? (strong mapping - 3)



How to link EuroVoc to BabelNet? (strong mapping - 3)





EuroVoc Graph

How to link EuroVoc to BabelNet? (strong mapping - 3)

EuroVoc-0821 (missile)

bn:00055322n (missile)

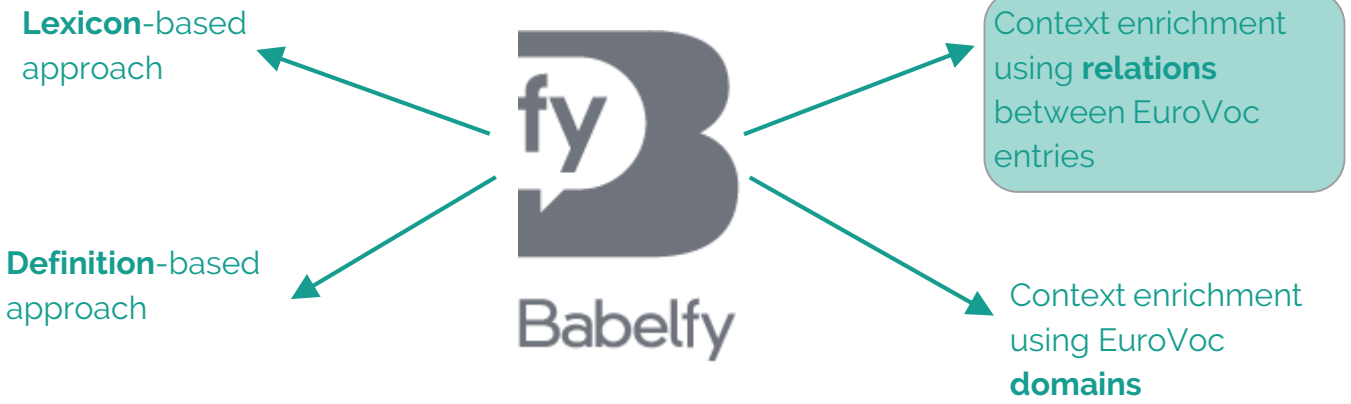
MIND THE LEXICAL GAP

EuroVoc Building block of the semantic web

BabelNet

How to link EuroVoc to BabelNet? (strong mapping)

We can leverage **Babelfy**, our joint graph-based approach to multilingual **Entity Linking** and **Word Sense Disambiguation.**



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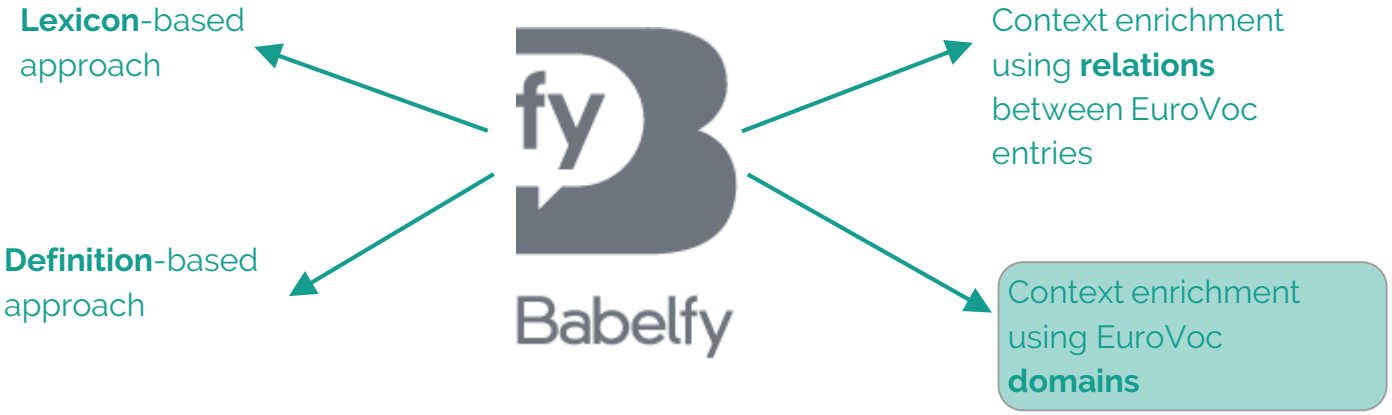


How to link EuroVoc to BabelNet? (strong mapping - 4)

Context enrichment using EuroVoc **domains**

Target word: **Eureka**

How to link EuroVoc to Ba

Context enrichment using EuroVoc **domains**

Target word: **Eureka**

Eureka

UF *Eureka charter*
Eureka ministerial conference
Eureka programme
Eureka project
European Research Coordination Agency

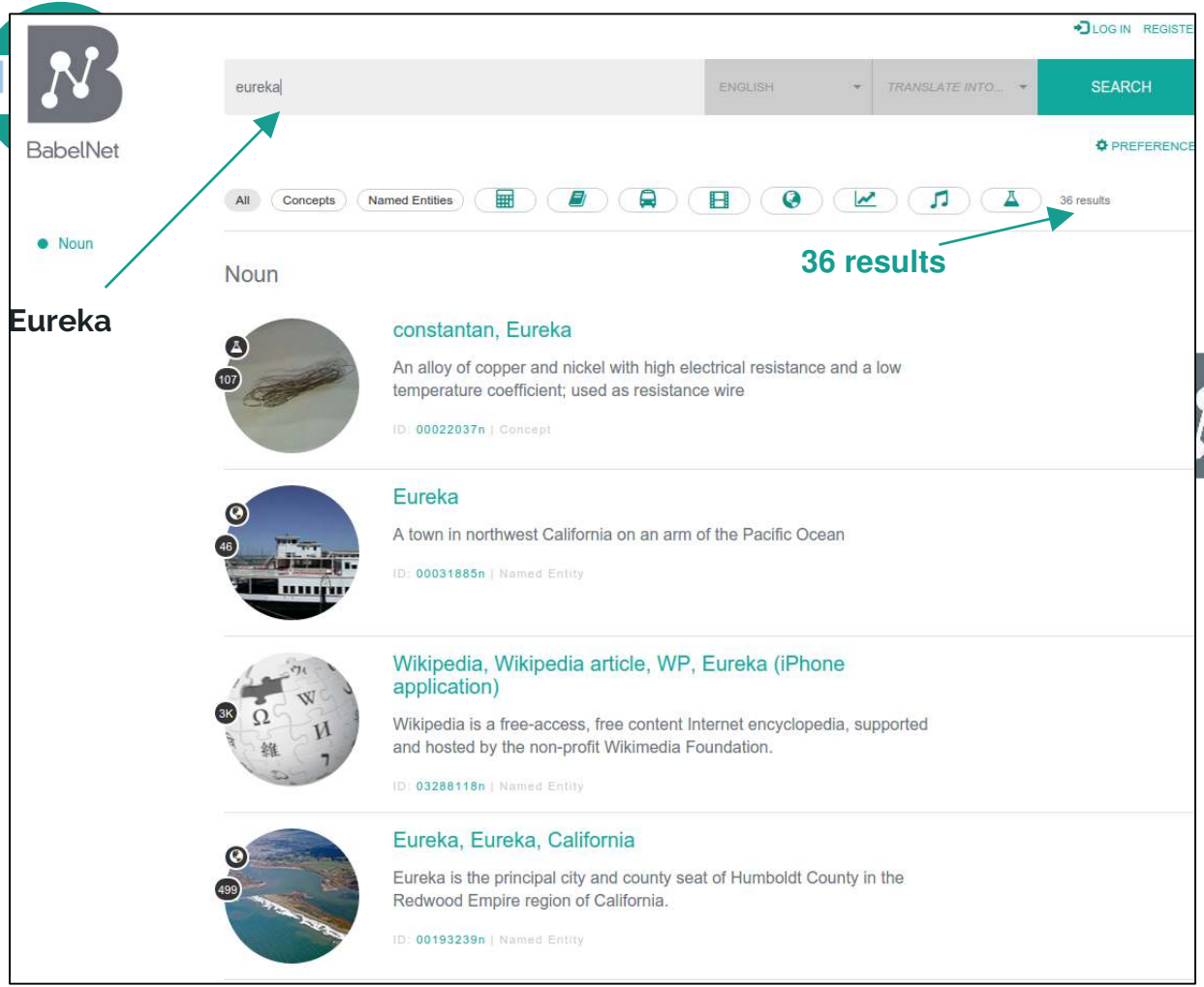
64 PRODUCTION, TECHNOLOGY AND RESEARCH
MT 6416 research and intellectual property
BT1 research policy

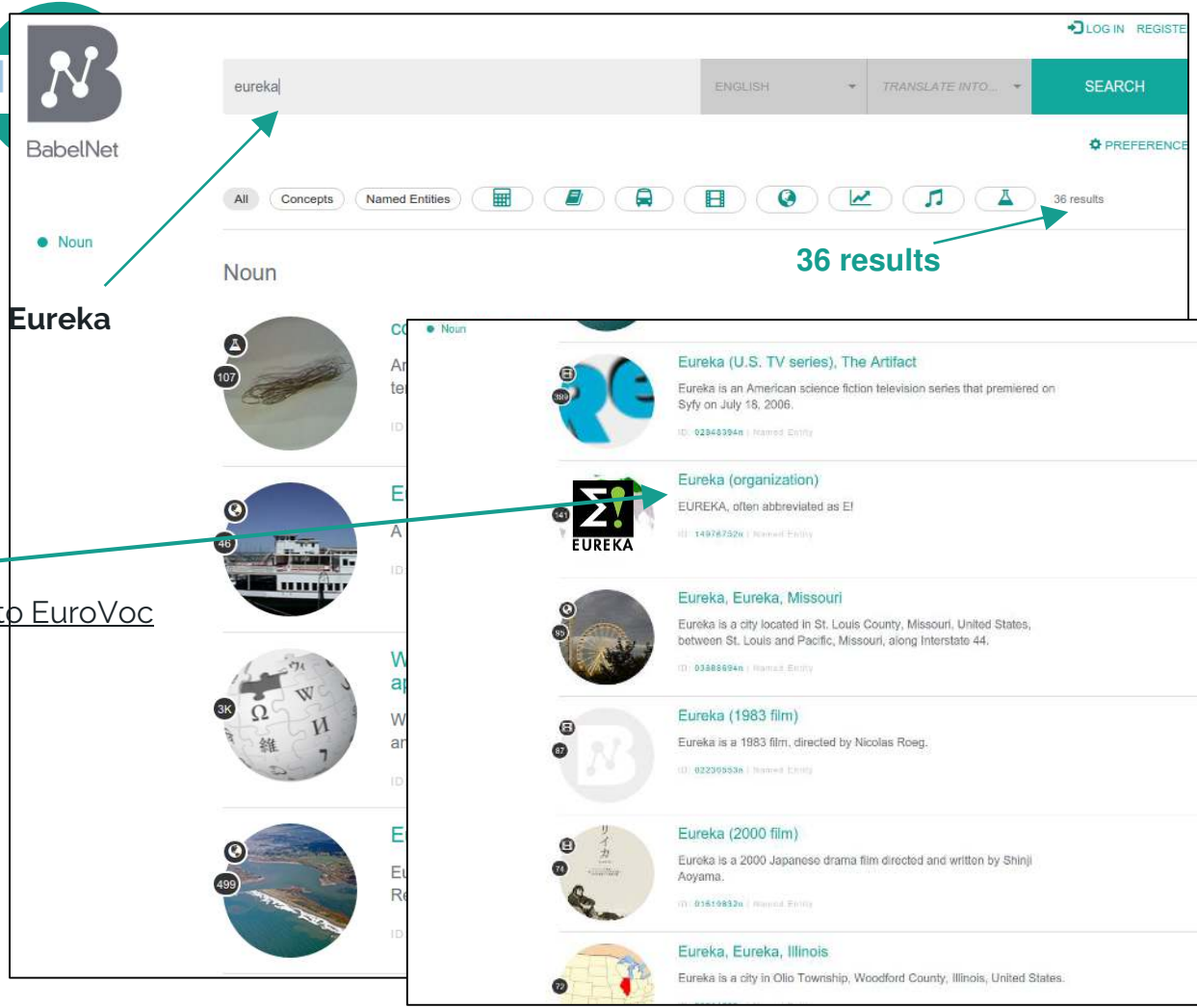
URI *http://eurovoc.europa.eu/3654*

LANGUAGE EQUIVALENTS

BG	Еureka
ES	Eureka
CS	program Eureka
DA	Eureka
DE	Eureka
ET	Eureka
EL	Eureka
EN	**Eureka**
FR	Eureka
HR	Eureka
IT	Eureka
LV	Eureka
LT	Eureka
HU	Eureka
MT	Eureka
NL	Eureka
PL	Eureka
PT	Eureka
RO	Eureka
SK	Eureka
SL	Eureka
FI	Eureka
SV	Eureka
SR	Еureka
MK	Еureka
SQ	Eureka

Target word: **Eureka**





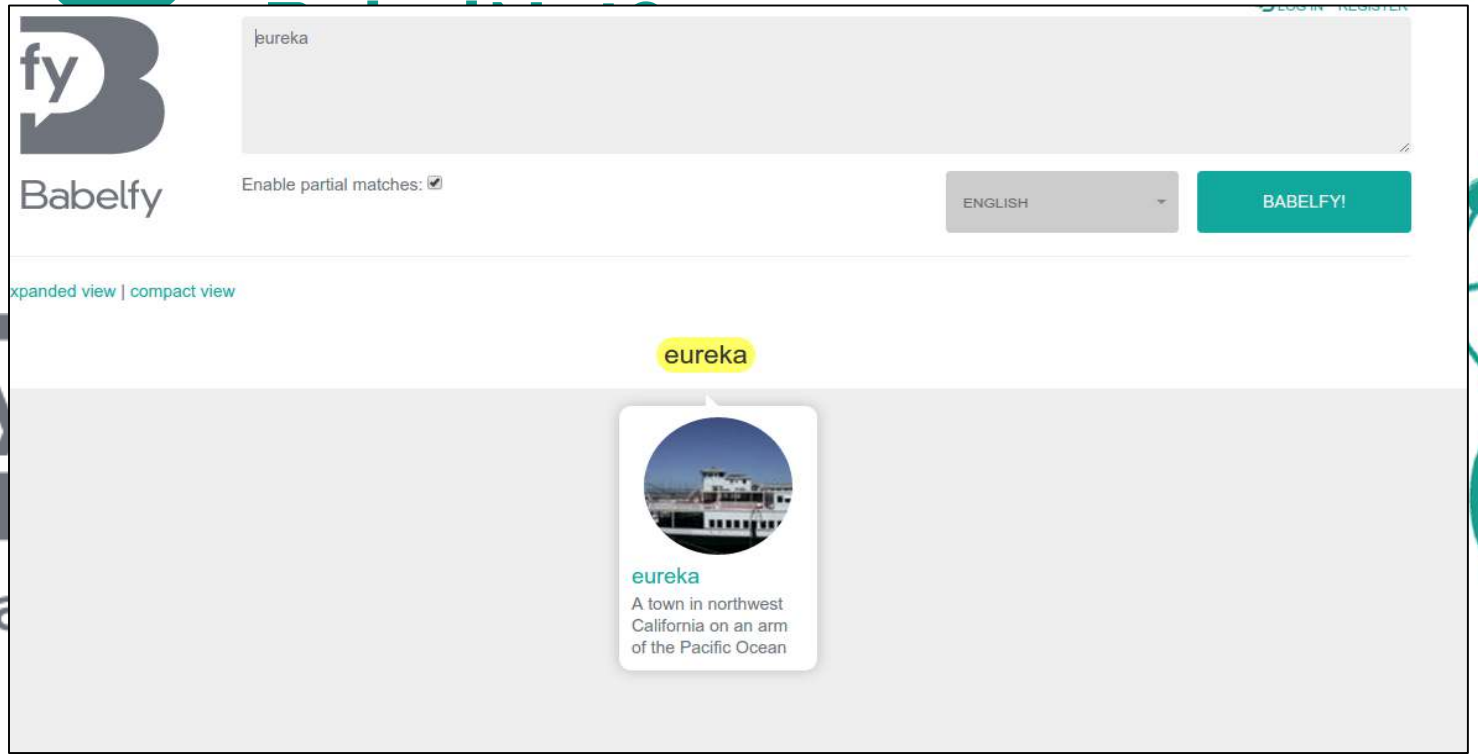
Target word: **Eureka**

Correct mapping to EuroVoc

How to link EuroVoc to BabelNet? (strong mapping - 4)

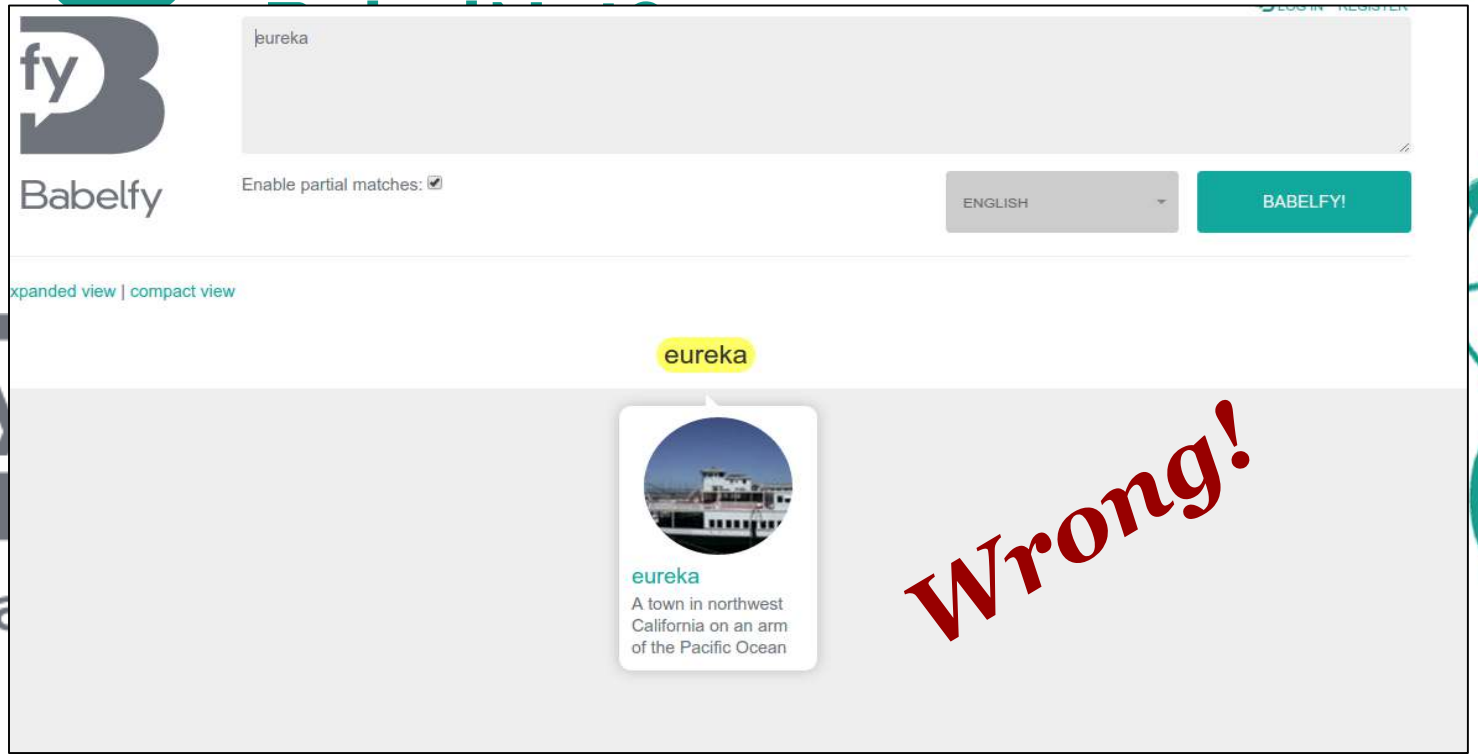
- Disambiguating **Eureka** with no context:

How to link EuroVoc to



A town in northwest California on an arm of the Pacific Ocean

How to link EuroVoc to



A town in northwest California on an arm of the Pacific Ocean

How to link EuroVoc to BabelNet? (strong mapping - 4)

+

EuroVoc Domains

c to

4)

MIND THE LEXICAL GAP
EuroVoc Building block of the semantic web

Eureka

UF *Eureka charter*
Eureka ministerial conference
Eureka programme
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European Research Coordination Agency

64 PRODUCTION, TECHNOLOGY AND RESEARCH
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LANGUAGE EQUIVALENTS	
BG	Еureka
ES	Eureka
CS	program Eureka
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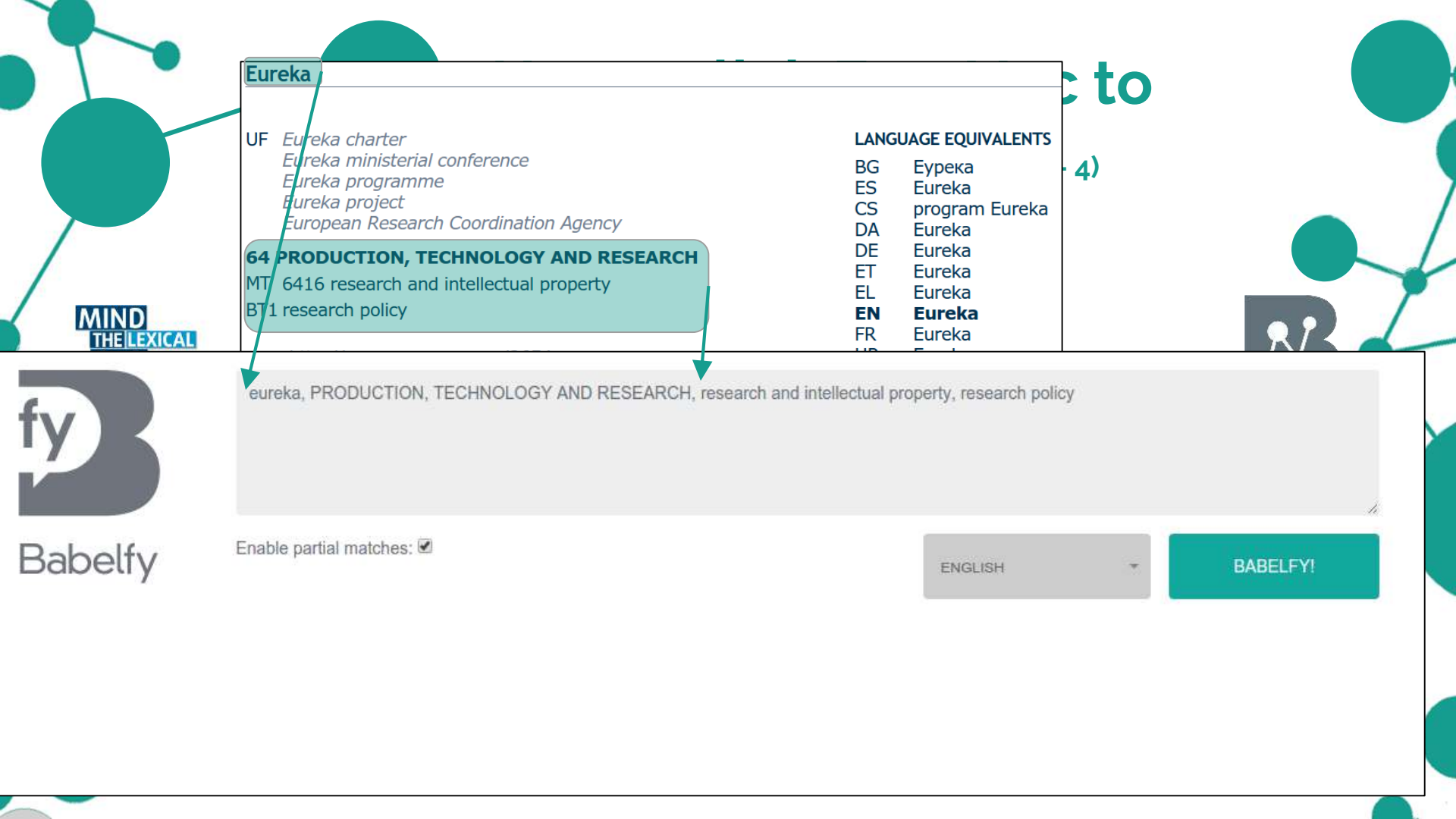
ET	Eureka
EL	Eureka
EN	**Eureka**
FR	Eureka
HR	Eureka
IT	Eureka
LV	Eureka
LT	Eureka
HU	Eureka
MT	Eureka
NL	Eureka
PL	Eureka
PT	Eureka
RO	Eureka
SK	Eureka
SL	Eureka
FI	Eureka
SV	Eureka
SR	Еureka
MK	Еureka
SQ	Eureka

Babelfy

EuroVoc Domains



c to

4)

Eureka

UF *Eureka charter*
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LANGUAGE EQUIVALENTS

BG	Еурека
ES	Eureka
CS	program Eureka
DA	Eureka
DE	Eureka
ET	Eureka
EL	Eureka
EN	**Eureka**
FR	Eureka

MIND THE LEXICAL

fy

Babelfy

eureka, PRODUCTION, TECHNOLOGY AND RESEARCH, research and intellectual property, research policy

Enable partial matches: ☑

ENGLISH

BABELFY!

LOG IN REGISTER

Babelfy

eureka, PRODUCTION, TECHNOLOGY AND RESEARCH, research and intellectual property, research policy

Enable partial matches:

ENGLISH

BABELFY!

expanded view | compact view

eureka , PRODUCTION , TECHNOLOGY AND RESEARCH , research and intellectual property , research policy

eureka
EUREKA, often abbreviated as E!

PRODUCTION
(economics) manufacturing or mining or growing something (usually i…

Agency for Science, Tec and Resea

TECHNOLOGY AND RESEARCH
The Agency for Science, Technology and Research is a statutory board und…

TECHNOLOGY
An engineering

research
Systematic investigation to establish facts

intellectual property
Intangible property that is the result of creativity (such as patents or trademar…

intellectual
Of or associated with or requiring the use of the mind

ity of Suss
e Policy

research policy
Science and Technology Policy Research is an academic center at…

research
Systematic investigation to establish facts

Name

How to link EuroVoc to BabelNet? (strong mapping - 4)

EuroVoc-3654 (Eureka)

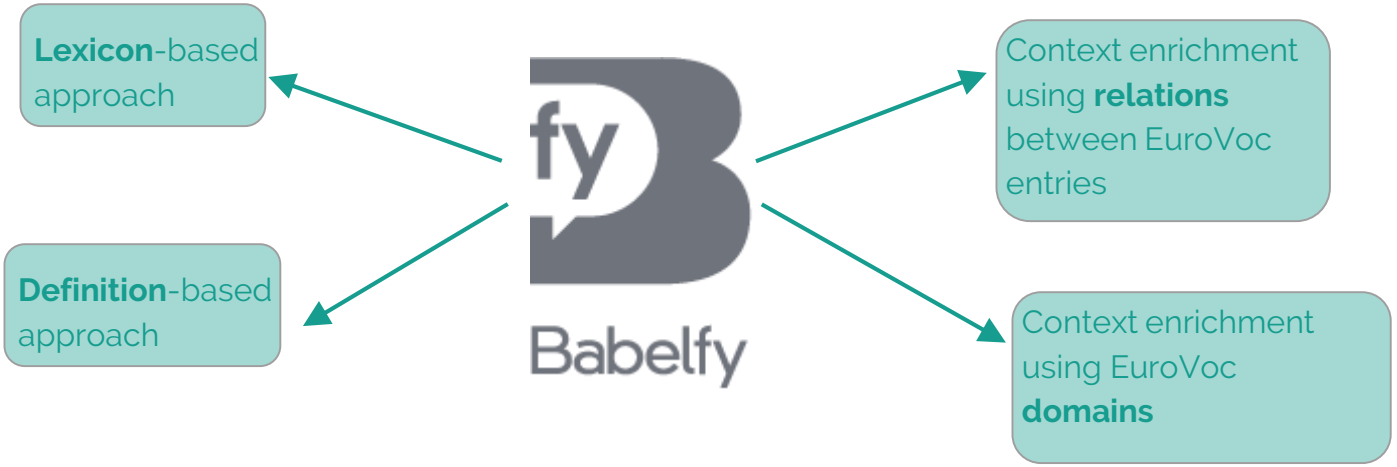
EUREKA

bn:14976752n (Eureka)

BabelNet

How to link EuroVoc to BabelNet? (strong mapping)

A more advanced mapping approach could leverage **all these basic strategies** at the same time to improve accuracy



Conclusion (on EuroVoc)

- Various basic approaches for the BabelNet-EuroVoc mapping:
  - **Lexicon-based approach**
    - Exploits lemmas and translations of a EuroVoc entry
  - **Definition-based approach**
    - Exploits the textual definition as useful context for disambiguation
  - **Context enrichment using relations**
    - Exploits relations between EuroVoc entries as context
  - **Context enrichment using domains**
    - Exploits EuroVoc domains and subdomains
- More advanced techniques: semantic similarities based on vector-space models, etc.

Advantages

By integrating with BabelNet, EuroVoc (like IATE) will greatly enlarge its scope and extend its multilingual dictionary to more than **250** languages.

MIND THE LEXICAL GAP
EuroVoc Building block of the semantic web

Advantages

- EuroVoc is already a **semantic network**, but its scope is relatively limited: by integrating with BabelNet, many more connections will be introduced, enlarging EuroVoc's scope and dimension

- New content (e.g. **images**) associated with EuroVoc entries

missile

UF *nuclear missile*

08 INTERNATIONAL RELATIONS

MT 0821 defence
BT1 military equipment
NT1 anti-missile defence
NT1 ballistic missile
NT1 guided missile
NT1 intercontinental missile
RT Euro-missile [0816]
nuclear technology [6621]

2 relations

949 semantic relations

missile

A rocket ca
ballistic or

ID: 00055322

Euramis

Euramis

European **A**dvanced **M**ultilingual **I**nformation **S**ystem

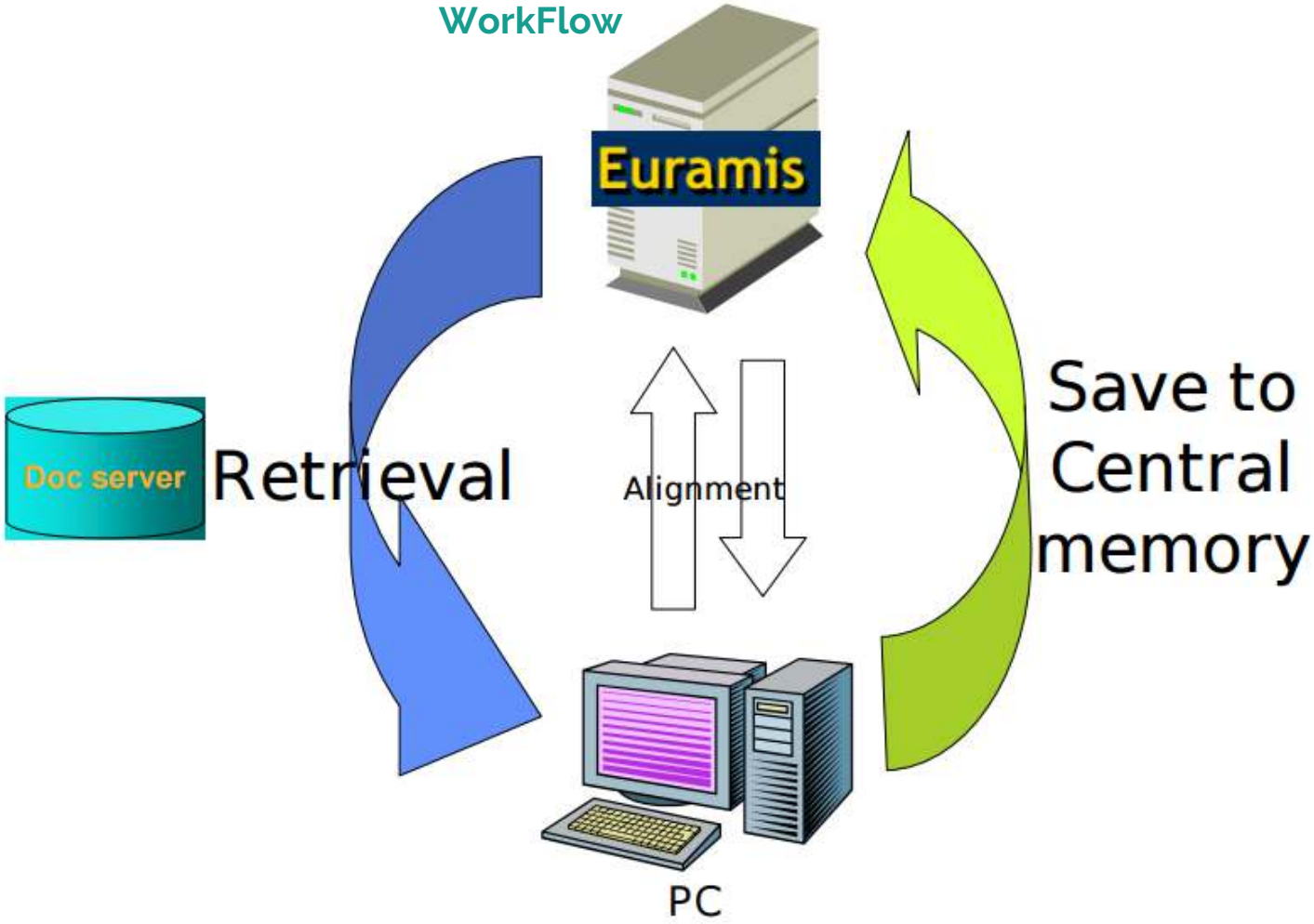
Euramis

- Euramis is a system of **databases** or **memories** (and associated tools) fed by the various institutions jointly (Legis-Process) or individually.

- It acts as a multilingual, multidirectional repository of clearly labelled **equivalent phrases** ("segments") belonging to official EU documents allowing their re-use in translation in all European Institutions.

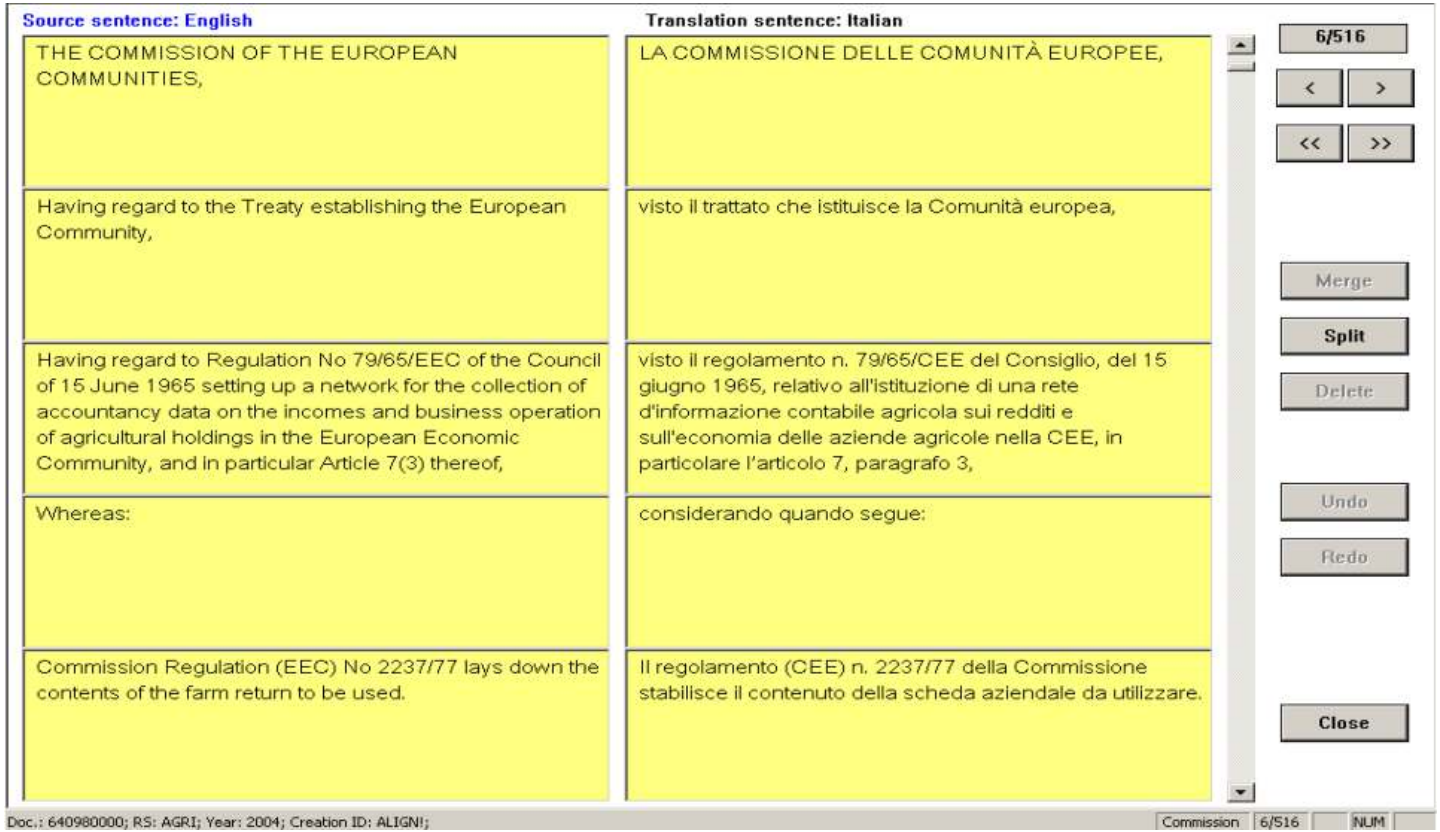
- The system also contains a set of **interfaces** to manage access rights for sentence and document management, based on the user's login identification, for both Commission staff and other institution's staff.

WorkFlow


Euramis
Doc server
Retrieval
Alignment
Save to Central memory
PC

Euramis Euramis

Alignment



Euramis

Euramis

- **ENGLISH:** These imports competed with each other and with the like product manufactured by the Community industry.

- **SPANISH:** Estas importaciones compitieron entre sí y con el producto similar manufacturado por la industria de la Comunidad.

- **ENGLISH:** The Commission, therefore, has excluded this company from the definition of the 'the Community industry` for the purpose of its injury determination.

- **SPANISH:** La Comisión, por lo tanto, ha excluido a esta empresa de la definición de la industria de la Comunidad a efectos de la determinación del perjuicio.

Euramis

- **Keyword search** is currently used to browse the Euramis content:

...the expected results, owing to the dumped **imports**.

These **imports** competed with each other and with the like product manufactured by the Community industry.

The volume of dumped **imports** into the Community of the product concerned originating...

Euramis

Semantic search with Euramis

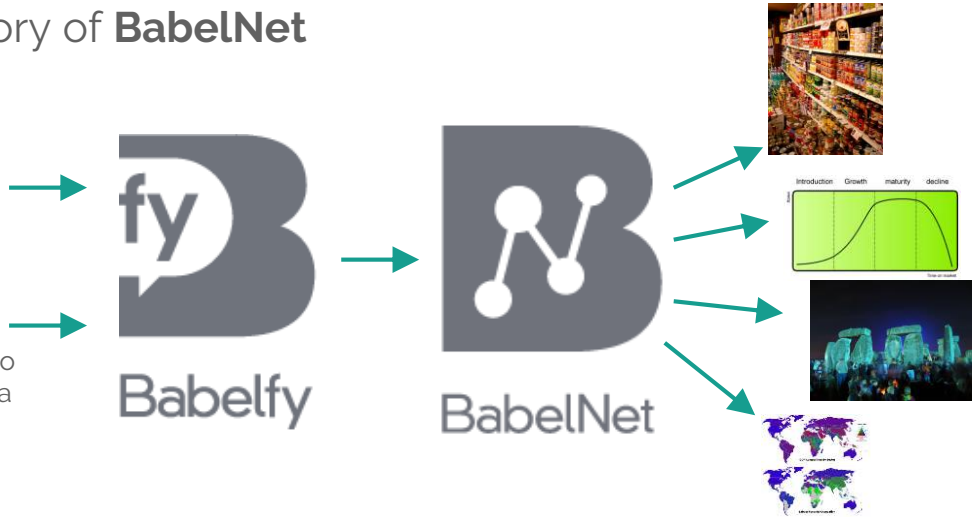
- **Keyword search** is currently used to browse the Euramis content:

- We can use **BabelNet synsets in place of plain keywords!**

Euramis

- **What can we do with Euramis?**
  - Being a repository of parallel text, Euramis does **not** associate each sentence with a particular lemma = no strict mapping Euramis-BabelNet is possible at the sentence level
  - **But**: we can still exploit **Babelfy** to **index** Euramis sentences with the sense inventory of **BabelNet**

- **ENGLISH:** These imports competed with each other and with the like product manufactured by the Community industry.
- **SPANISH:** Estas importaciones compitieron entre sí y con el producto similar manufacturado por la industria de la Comunidad.



Euramis

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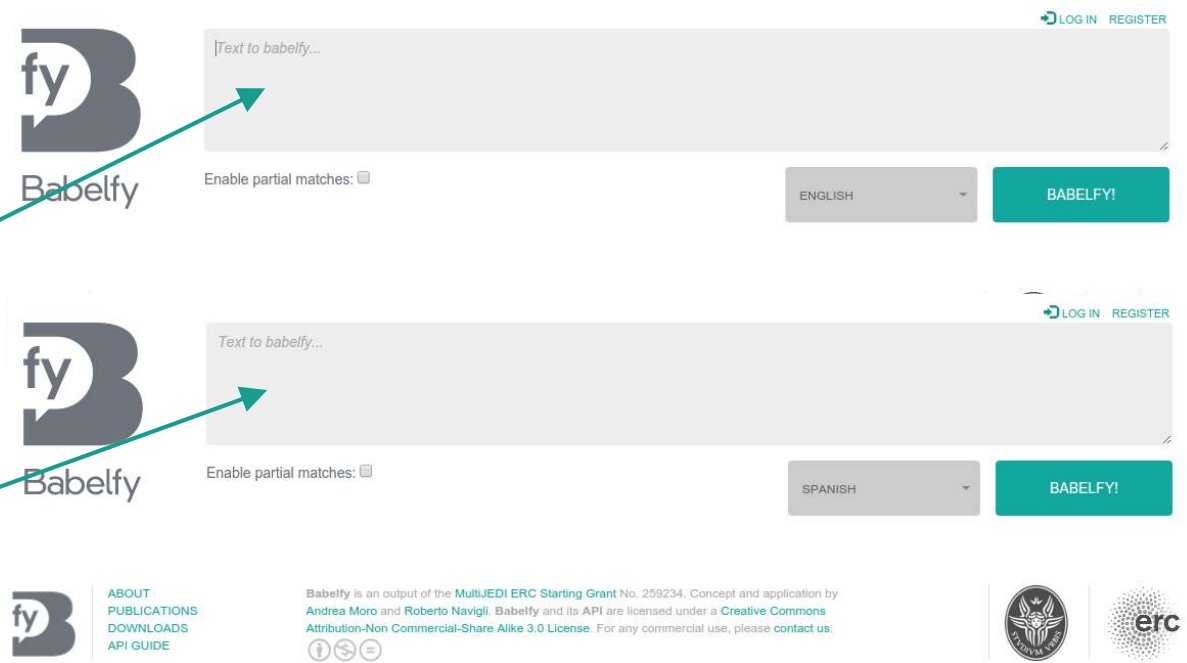


These imports competed with each other and with the like product manufactured by the Community industry .

imports
Commodities (goods or services) bought from a foreign country

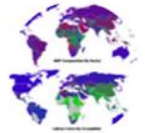
competed
Compete for something; engage in a contest; measure oneself against others

like
Resembling or similar; having the same or some of the same characteristics; ofte...

product
Commodities offered for sale

manufactured
Put together out of artificial or natural components or parts; He manufactured a...

Community
A group of people living in a particular local area



industry
The organized action of making of goods and services for sale

expanded view | compact view

Estas importaciones compitieron entre sí y con el producto similar manufacturado por la industria de la Comunidad .

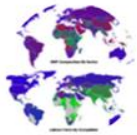
importaciones
Commodities (goods or services) bought from a foreign country

compitieron
Compete for something; engage in a contest; measure oneself against others

producto
Commodities offered for sale

similar
Having the same or similar characteristics

manufacturado
Put together out of artificial or natural components or parts; He manufactured a



industria
The organized action of making of goods and services for sale

Comunidad
A group of people living in a particular local area

Euramis

Euramis

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producto

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manufacturado

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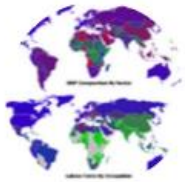

industria

The organized action of making of goods and services for sale

Comunidad

A group of people living in a particular local area

Euramis Euramis

- **ENGLISH:** The Commission, therefore, has excluded this company from the definition of the 'the Community industry` for the purpose of its injury determination.

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Euramis

Euramis

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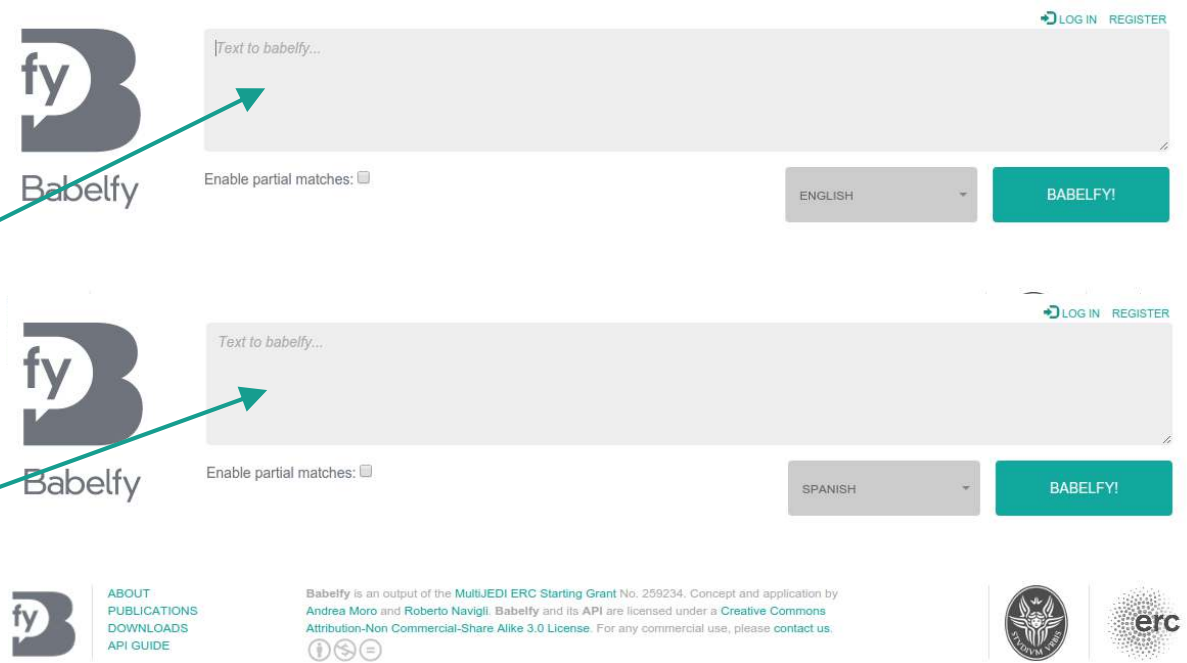


The Commission , therefore, has excluded this company from the definition of the 'the Community industry

Commission
A fee for services rendered based on a percentage of an amount received or…

excluded
Prevent from entering; shut out

company
An institution created to conduct business

definition
A concise explanation of the meaning of a word or phrase or symbol

Community
A group of people living in a particular local area

industry
The people or companies engaged in a particular kind of commercial enterprise

expanded view | compact view

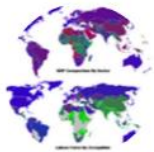
La Comisión , por lo tanto, ha excluido a esta empresa de la definición de la industria de la Comunidad a

Comisión
A fee for services rendered based on a percentage of an amount received or…

excluido
Prevent from entering; shut out

empresa
An institution created to conduct business

definición
A concise explanation of the meaning of a word or phrase or symbol



industria
The organized action of making of goods and services for sale

Comunidad
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Euramis

Euramis

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Comisión
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excluido
Prevent from entering; shut out

empresa
An institution created to conduct business

definición
A concise explanation of the meaning of a word or phrase or symbol

Comunidad
A group of people living in a particular local area

Euramis Conclusion (on Euramis)

- **Euramis** is neither a glossary nor a thesaurus: as such, a strict mapping from Euramis entries to BabelNet synsets is inherently impossible
- Instead of mapping, we can however **disambiguate** each sentence
- Thanks to the Euramis alignments and the multilingual nature of BabelNet, we can then identify the most frequent **Euramis concepts across languages**;
- We can **index** each sentence with the corresponding concepts identified through disambiguation, enabling concept-based browsing and search of the Euramis resource.

BabelNet as Semantic Glue!

- As a result of all mapping and indexing procedures we just saw, the three examined resources (IATE, EuroVoc and Euramis) can eventually **connected to each other** through BabelNet!

en

Definition	goods or services purchased from another country
Definition Ref.	'imports'. A Dictionary of Business and Management (5 ed.). Edited by Jonathan Law. Oxford University Press. Current Online Version: 2014, www.oxfordreference.c... [2.10.2014]
Term	**imports**
Reliability	3 (Reliable)
Term Ref.	Implementing Regulation (EU) No 1039/2014 establishing the standard import values for determining the entry price of certain fruit and vegetables, eur-lex.europa.eu/leg...
Date	02/10/2014
Term	**importations**
Reliability	2 (Minimum reliability)
Term Ref.	Implementing Regulation (EU) No 1001/2013 amending Annex I to Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff, 32013R1001:EN:NOT" >32013R1001/EN
Date	02/10/2014

it

Definition	merci, servizi o capitali provenienti dall'estero e immessi nel territorio di uno Stato
Definition Ref.	COM-IT sulla base di: Enciclopedia Treccani.it, Importazione, www.treccani.it/encic... [31.10.2014]
Term	**importazioni**

import

20 TRADE
MT 2016 trade
BT1 trading operation
NT1 import (EU) [4.4]
NT1 re-import
RT countervailing charge [2011]
customs valuation [2011]
free circulation [2011]
import monopoly [4031]
import tax [2446]

URI *http://eurovoc.europa.eu/1309*

Has Exact Match
Imports (ECLAS)
import (GEMET)

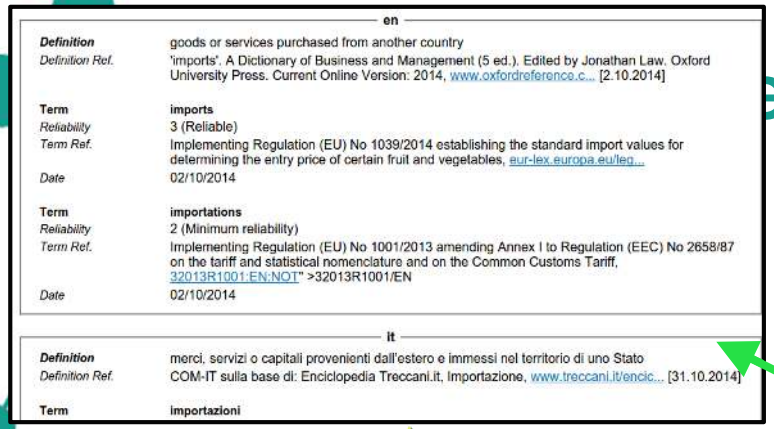
EQUIVALENTI IN ALTRE LINGUE

BG	вноС
ES	importación
CS	dovoz
DA	import
DE	Einfuhr
ET	import
EL	εισαγωγές
EN	**import**
FR	importation
HR	uvoz
IT	importazione
LV	imports
LT	importas
HU	behozatal
MT	importazzjoni
NL	invoer
PL	import
PT	importação
RO	import
SK	dovoz
SL	uvoz
FI	tuonti
SV	import
SR	увоз
MK	увоз
SQ	importim

Euramis

- These **imports** competed with each other and with the like product manufactured by the Community industry.
- Estas **importaciones** compitieron entre sí y con el producto similar manufacturado por la industria de la Comunidad.

elNet as Se



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BabelNet

EuroVoc

import

20 TRADE
MT 2016 trade
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Has Exact Match
Imports (ECLAS)
import (GEMET)

EQUIVALENTI IN ALTRE LINGUE

BG	внос
ES	importación
CS	dovoz
DA	import
DE	Einfuhr
ET	import
EL	εισαγωγές
EN	**import**
FR	importation
HR	uvoz
IT	importazione
LV	imports
LT	importas
HU	behozatal
MT	importazzjoni
NL	invoer
PL	import
PT	importação
RO	import
SK	dovoz
SL	uvoz
FI	tuonti
SV	import
SR	увоз
MK	увоз
SQ	importim

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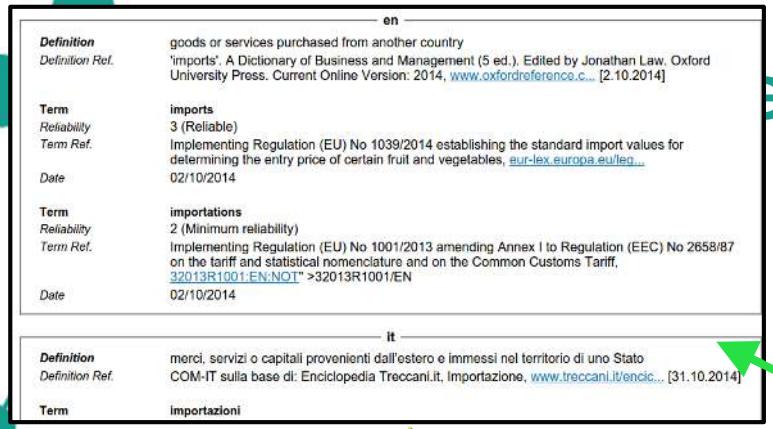
elNet as Se



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Date 02/10/2014

it

Definition merci, servizi o capitali provenienti dall'estero e immessi nel territorio di uno Stato
Definition Ref. COM-IT sulla base di: Enciclopedia Treccani.it, Importazione, www.treccani.it/encic... [31.10.2014]

Term importazioni

import

20 TRADE
MT 2016 trade
BT1 trading operation
NT1 import (EU) [4.4]
NT1 re-import
RT countervailing charge [2011]
customs valuation [2011]
free circulation [2011]
import monopoly [4031]
import tax [2446]

URI *http://eurovoc.europa.eu/1309*

Has Exact Match
Imports (ECLAS)
import (GEMET)

EQUIVALENTI IN ALTRE LINGUE

BG	внос
ES	importación
CS	dovoz
DA	import
DE	Einfuhr
ET	import
EL	εισαγωγές
EN	**import**
FR	importation
HR	uvoz
IT	importazione
LV	imports
LT	importas
HU	behozatal
MT	importazzjoni
NL	invoer
PL	import
PT	importação
RO	import
SK	dovoz
SL	uvoz
FI	tuonti
SV	import
SR	увоз
MK	увоз
SQ	importim

BabelNet

EuroVoc

Euramis

- These **imports** competed with each other and with the like product manufactured by the Community industry.

- Estas **importaciones** compitieron entre sí y con el producto similar manufacturado por la industria de la Comunidad.

Immediate applications

- Empowering **translation systems** with an increasingly higher degree of multilingual connections
- Direct bridge towards **extra-European languages** (Middle East, China, etc.) through translations and cross-language links
- Great improvement for terminology extraction, thanks to **parallel example sentences** provided by Euramis
- Multilingual support for the development of EU websites and online platforms, through a comprehensive, **cross-lingual up-to-date lexicon**

Immediate applications

- **Automatic updates** from all the main lexical resources across the web, hence reduced management costs;
- Powerful tool in the hands of **EU mediators**;
  - *Citizens have the right to write to any Community institution or body in one of the languages of the Member States and to receive a response in the same language (Article 24 TFEU, paragraph 4)*
- The overall perspective is to integrate through BabelNet many lexical resources, both European and extra-European, using advanced and reliable automatic mapping systems

The Road Ahead

- Obviously it is not just pushing a button and mapping

1. The **mapping quality** can be improved by
   - calibrating the disambiguation algorithm
   - integrating semantic vector disambiguation techniques
   - and much more
2. **Updating** and **syncing** is an issue to be taken into account
   - We are doing it with **BabelNet live**!

who:botticelli × Add a search term

REFINE YOUR SEARCH

MEDIA

- Image (44)
- Text (1)
- Only items with links to media

CAN I USE IT?

- Only With Permission (29)

45 results

Planche 12 : Esquisse d'après 'La Madone du Magnificat' de Sandro Botticelli Album de 59 planches. Etudes d'après des maîtres anciens exécutées à Munich et en Italie | Sandro Botticelli

painting (image-making)

View at KIK-IRPA, Brussels (Belgium)

Image

LOG IN REGISTER

Babelfy

Planche 12 : Esquisse d'après 'La Madonne du Magnificat' de Sandro Botticelli Album de 59 planches. Etudes d'après des maîtres anciens exécutées à Munich et en Italie | Sandro Botticelli

Enable partial matches: ☐

FRENCH

BABELFY!

expanded view | compact view

Planche 12 : Esquisse d'après 'La Madonne du Magnificat ' de Sandro Botticelli

Planche

A stout length of sawn timber; made in a wide variety of sizes

Esquisse

Preliminary drawing for later elaboration

Madonne

La Vierge à l'Enfant, ou Madone, est un thème récurrent en

Magnificat

(Luke) the canticle of the Virgin Mary (from Luke 1:46 beginning

Sandro Botticelli

Italian painter of mythological and religious paintings

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LOG IN REGISTER

Babelfy

Angyal a töviskoronával | Giovanni Lorenzo Bernini, Giovanni Lorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Giovanni Lorenzo Bernini, Lorenzo Bernini, Gian Lorenzo Bernini, Gianlorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Giovanni Lorenzo Bernini, Le Bernin, Gian Lorenzo Bernini, Gian Lorenzo Bernini, Gian Lorenzo Bernini, and Gian Lorenzo Bernini

Enable partial matches: ☐

AGNOSTIC

BABELFY!

expanded view | compact view

Angyal a töviskoronával | Giovanni Lorenzo Bernini, Giovanni Lorenzo Bernini , Gian Lorenzo Bernini ,

Angyal

Spiritual being attendant upon God

Bernini, Giovanni Lorenzo

Italian sculptor and

Gian Lorenzo Bernini

Italian sculptor and

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